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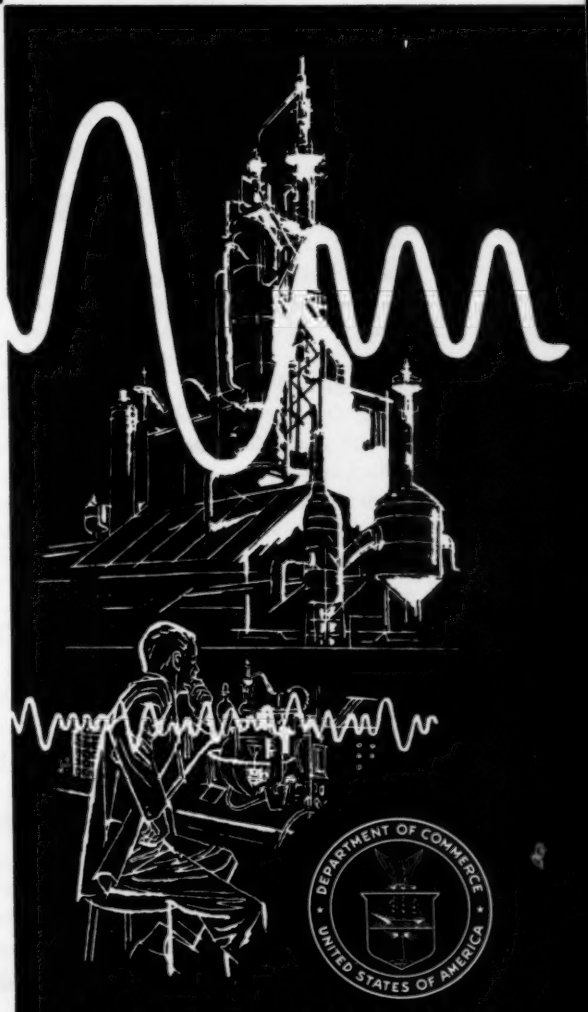

U. S. DEPARTMENT OF COMMERCE

Office of Technical Services

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U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

OFFICE OF TECHNICAL SERVICES
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AD-418 350 DIV. 2

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AD-417 989 DIV. 1

X-RAY DIFFRACTION CAMERAS
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AD-418 026 DIV. 25

TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-417 908 Div. 1, 22
OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
FIRE CONTROL FOR UH-1B HELICOPTER ARMAMENT SUBSYSTEM XM3,
by Robert C. Pfeilsticker and John C. Glynn.
July 63, 25p.
Proj. 941 10 001 07
FA Technical memo. M64-2-1
Unclassified report

Descriptors: (*Helicopters, Aircraft fire control systems), (*Aircraft fire control systems, Helicopters), Errors, Targets, Statistical data, Army aircraft, Ballistics, Rockets, Rocket launchers, Aircraft ammunition, Fire control systems.

The Helicopter Armament Subsystem XM3 for the UH-1B helicopter is an area weapon system that is capable of firing modified 2.75 in. rockets from two pods, one mounted on each side of the helicopter. This report documents the analysis which accompanied the design of the XM3 fire control system. The analysis is concerned with realistic estimates of input and component errors which produce output errors. The output errors depend on the theoretical fire control system mechanization and the tactical employment involved. Preliminary ballistic data was used as a basis for rocket flight. (Author)

AD-417 989 Div. 1, 9
OTS price $3.60

Boeing Scientific Research Labs., Seattle, Wash.
SECOND-ORDER THEORY OF OPTIMUM TWO-DIMENSIONAL WINGS IN SUPERSONIC FLOW INCLUDING THE EFFECTS OF FRICTION,
by Angelo Miele and Arthur H. Lusty. Aug 63, 30p.
Document D1 82 0284
Unclassified report

Also available from the author.

Descriptors: (*Wings, Supersonic flow), Aerodynamic characteristics, Friction, Two-dimensional flow, Lift, Drag, Airfoils, Fluid flow, Theory, Thickness, Geometry, Supersonic characteristics, Pressure, Aerodynamic configurations, Optimization, Mathematical analysis, Mathematical prediction.

The problem of minimizing the zero-life drag of two-dimensional wings in supersonic flow is considered under the following assumptions: (1) Busemann's second-order theory is employed to evaluate the pressure distribution, (2) the friction coefficient is constant, (3) the chord of the airfoil is free, and (4) either the thickness or the enclosed area is prescribed. (Author)

AD-418 022 Div. 1
OTS price $3.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
TESTS OF H-21C HELICOPTER ROTOR TRANSMISSIONS OPERATED WITHOUT OIL,
by James T. Robinson. July 63, 36p.
Proj. 1M023201A099
BRL MR1493 Unclassified report

Descriptors: (*Helicopter rotors, Transmissions), (*Helicopters, Vulnerability), Transmission gears, Bearings, Lubrication, Performance, Small arms ammunition, Ammunition damage, Simulation, Tests, Life expectancy.

The data in this report represents field observations of controlled damage tests of the forward, central and aft rotor transmissions of the H-21C ''Work Horse'' helicopter at Aberdeen Proving Ground, Maryland. Damage incurred by gears, bearings and other components of these transmissions, operating without oil for periods up to one hour, is presented. These tests are preliminary to actual gunfire tests to determine the vulnerability of the H21 power plant and gear trains to impacts by small arms. (Author)

AD-418 100 Div. 1, 14
OTS price $4.60

Kaysam Corp. of America, Paterson, N. J.
STUDY OF PHYSICAL AND CHEMICAL CHARACTERISTICS OF BALLOONS AND BALLOON MATERIALS.
Quarterly progress rept. no. 1, Mar-31 May 63,
by Eric Nelson. 31 May 63, 42p.
Contract DA36 039AMC02160E, Proj. 1A0 2500A126 01 04 Unclassified report

Descriptors: (*Balloons, Materials), Polymers, Synthetic rubber, Rubber, Materials, Molecular structure, Films, Zinc compounds, Oxides, Electron microscopy, Ozone, Infrared radiation, Tensile properties, Radiation damage, Flight testing, Physical properties, Manufacturing methods, Processing, Chemical properties, Performance (Engineering).

AD-418 306 Div. 1, 30, 6
OTS price $2.60

Sperry Gyroscope Co., Great Neck, N. Y.
PWI REQUIREMENTS STUDY.
Interim rept.
July 63, 17p.
Contract FAA BRD322, Proj. 110 504
Unclassified report

Descriptors: (*Warning systems, Flight simulators), (*Aviation safety, Warning systems), Training devices, Aircraft, Detection, Probability, Vision, Aerial targets, Target angle, Tables.

A description is presented of the results obtained from two experiments in the Pilot Warning

Instrument (PWI) Evaluation Study. The experiments were performed using the F-100 A simulator in an F-151 gunnery trainer. One experiment studied the precision with which warning information must be presented to the pilot in order to be of maximal benefit. It was found that as bearing information increased in accuracy up to a standard deviation of 1.5 degrees probability of detection improved. The second experiment was designed to measure the usefulness of different levels of PWI. The general conclusion which may be drawn from the experiment is that a simple warning has little effect on the detectability of intruders. (Author)

AD-418 370 Div. 1, 33
OTS price $4.60

Fulton, Robert E., Jr., Newton, Conn.
RETRACTING THE FULTON SKYHOOK YOKE ON ARMY TYPE CV2B (CARIBOU) AIRCRAFT.
May 63, 30p.
Contract DA44 177AMC891, Task 9R96 11 001 02
ATRECOM TR63 51 Unclassified report

Descriptors: (*Transport planes, Aerial pickup systems), Extendable structures, Army aircraft, Short take-off planes, Aircraft equipment, Feasibility studies, Airborne.

The Army Type CV2B (Caribou) aircraft possesses an in-flight pickup capability when fitted with Fulton SKYHOOK equipment. A standard part of this equipment consists of a yoke, or V-shaped fork, rigidly mounted on the nose of the aircraft. A study is presented on the feasibility of installing a retractable yoke in lieu of the fixed one. Design considerations were studied, and the results showed that such a yoke could be constructed. Of five possible designs, one showed considerable promise and is recommended as the most favorable. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-417 854 Div. 2, 1
OTS price $1.60

National Bureau of Standards, Washington, D. C.
THE NBS HUMIDITY EXPERIMENT ON THE MANNED BALLOON FLIGHT STRATO-LAB HIGH NO. 5,
by F. E. Jones, H. A. Bowman, L. M. Allison, and E. T. Woolard. July 62, 15p.
Proj. 1404 20 14424
NBS Rept. no. 7550 Unclassified report

Descriptors: (*Balloons, Manned), (*Humidity, Atmosphere), Measurement, Data transmission systems, Hygrometers, Meteorological instruments, Films, Circuits, Resistance (Electrical).

This report deals with the results of a humidity experiment in which a barium fluoride element was carried along aboard the manned balloon flight, Strato-Lab High No. 5, and provided the only measurements of atmospheric humidity made on the flight. (Author)

AD-417 910 Div. 2, 8
OTS price $2.60

Electrical Engineering Research Lab., U. of Texas Austin.
LUNAR RADIATION AT 3.2 MILLIMETERS AND A LUNAR MODEL,
by Charles W. Tolbert and Gary T. Coats.
15 Aug 63, 24p. Rept. no. 7-24
Grant DA SIG36 039 61G11
Unclassified report

Descriptors: (*Lunar environment, Extraterrestrial radio waves), (*Terrain models, Moon), Extraterrestrial topography, Radio astronomy, Dust, Meteorites, Measurement, Extremely high frequency, Basalt, Emissivity, Optical properties, Attenuation, Temperature, Phase measurement, Telescopes, Heating, Cooling, Superhigh frequency, Radiometers, Atmosphere models, Thermal radiation, Diffusion.

The measurement of 3.2-mm lunar emission temperatures during lunations and the measurement of 4.3-mm electromagnetic characteristics of earth-type pumice and granite are reported. The results of these measurements and similar measurements at other wavelengths are interpreted in terms of the physical characteristics of the material at and near the surface of the moon. The average physical characteristics of the central lunar area are typified by a surface stratum of pumice 30 cm thick, or a dust 3 cm thick, or a combination of pumice and dust of intermediate thickness. The surface stratum pumice is about one-tenth the density of earth-type pumice. The phase delay of RF temperatures relative to infrared temperatures could be associated with a varying subsurface stratum temperature induced by pulsating flows of sublunar surface thermal energy into the subsurface stratum under the stimulus of solar heating and cooling of the surface stratum. For the heaypothesized model associated with a sublunar surface source of thermal energy, the substrata consists of approximately 90 cm of pumice one-third the density of earth pumice based on a more dense material such as basalt. (Author)

AD-417 935 Div. 2, 30
OTS price $1.60

Travelers Research Center, Inc., Hartford, Conn.
WEATHER DATA PROCESSING RESEARCH AND DEVELOPMENT PROGRAM.
Monthly progress rept. no. 1.
July 63, 16p.
Unclassified report

Descriptors: (*Meteorological parameters, Data processing systems), (*Data processing systems, Research program administration), Computers, Magnetic tape, Logistics, Weather forecasting, Meteorological radar, Statistical analysis, Matrix algebra, Programming languages, Visibility, Cloud cover, Climatology.

AD-418 187 Div. 2
OTS price $2.60

Allied Research Associates Inc., Concord, Mass.
AN ANALYSIS OF STRATIFORM CLOUD PATTERNS IN THE CANARY ISLANDS REGION,
by Earl S. Merritt. 1 July 63, 18p.
Contract AF19 628 320, Proj. 7659, Task 765901
AFCRL 63 694 Unclassified report

Descriptors: (*Meteorological satellites, Clouds), (*Stratus clouds, Meteorological satellites), Photographic analysis, Atlantic ocean islands, Air mass analysis.

TIROS-observed stratiform cloud patterns of the Canary Islands region are analyzed during two different synoptic situation. The results of these analyses suggest that the variations in cloud distribution in these cases are related to variations in the direction of the low level wind. Application of this hypothesis provides

a possible explanation for the 'doughnut' cloud which appeared in TIROS I photographs of this area. (Author)

AD-418 198 Div. 2
OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
COMPARISON OF SURFACE FEATURES OF TEKTITES AND GEOTHERMALLY ETCHED OBSIDIAN,
by Lee E. Humiston and Richard T. Zbur. Apr 63, 65p.
NOTS TP3142 Unclassified report

Descriptors: (*Meteorites, Surface properties), Physical properties, Erosion, Data, Etched crystals, Coatings, Silicon, Geology.

This report describes the striking similarities between various types of tektite surfaces and geothermally etched obsidian (here named cosoites) from Coso Hot Springs, Inyo County, Calif. The obsidian has been etched by the action of hot-spring waters. The etching found on the obsidian consists of random patterns of pitting and grooving and does not follow flow lines or cracks that are present in some of the samples. Generally, only one or two sides of a specimen have been exposed to the etching action, the remaining sides having been protected by the parent mass or by a coating of siliceous sinter. Most of the recognized surface features of tektites are found on these obsidian specimens. It is therefore concluded that much of the surface texture of some tektites may be considered secondary features developed largely by chemical etching and by geologic processes of weathering, abrasion by wind sculpture, and transport by water. (Author)

AD-418 311 Div. 2, 25
OTS price $8.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE CHEMICAL KINETICS OF ATMOSPHERIC DEIONIZATION,
by M. H. Bortner. Sep 63, 88p. Rept. no. R63SD34
Contract AF19 604 8820
Unclassified report

Descriptors: (*Atmosphere, Ionization), Recombination reactions, Ionosphere, Reaction kinetics, Dissociation, Ions, Electrons.

The chemical kinetics of the atmosphere determines its composition and changes therein. This is true in the case of an abnormally highly ionized atmosphere such as that existing after a nuclear burst. This study is directed toward the understanding of the chemical kinetics of such an atmosphere. The reaction mechanisms and rates have therefore been studied in detail. The effect of various combinations of reactions on composition has been considered and is discussed. The rates of the individual reactions and the available data on these rate constants have been investigated. Considering the large uncertainties in the values of many of the rate constants and the importance of each of the individual reactions, suggestions are made of reactions which are most in need of further investigation. A summary of recommended values for the rate constants is given. (Author)

AD-418 337 Div. 2
OTS price $3.60

Israel Inst. of Tech. (Haifa).
OBSERVATIONS ON NIGHT-SKY CERENKOV RADIATION IN EXTENSIVE AIR SHOWERS.
Final rept.,
by H. Kasha. 15 May 63, 1v.
Contract AF61 052 196
AFCRL 63 881 Unclassified report

Descriptors: (*Cerenkov radiation, Cosmic rays), Electrons, Energy, Distribution, Radiation measurement systems, Night sky.

The Cerenkov light associated with EAS of sizes between aprox. 2 times 10 to the 4th and 2 times 10 to the 6th power was observed. The size spectrum of the associated showers is much flatter than that of all events, and the maximum pulse heights recorded for showers of a given size are almost independent of the particle number. This can be interpreted as a consequence of the zenith angle distribution of the EAS. The maximum intensity of the Cerenkov light was found not at the centre but at some 20 m from it. This may be explained by the angular divergence of the shower particles. (Author)

AD-418 350 Div. 2, 30
OTS price $6.60

Ecole Normale Superieure (France).
RESEARCH ON RADIATION FIELDS ASSOCIATED WITH WHISTLERS,
by J. Delloue, M. Garnier and P. Bildstein.
30 Sep 62, 1v.
Contract AF61 052 427
AFCRL 63 362 Unclassified report

Descriptors: (*Whistlers, Measurement), Propagation, Polarization, Data transmission systems, Radio communication system, Loop antennas, Preamplifiers, Amplifiers, Analog computers.

Directions of arrival of atmospheric whistlers was determined using three stations located on the ground. The method is described and the accuracy is evaluated. The necessity of frequency selective operation is shown and the choice of bandwidth discussed. Equipment designed to operate over long bases of the order of magnitude of a wavelength is described and preliminary results presented. The direction of arrival is generally close to the direction of the magnetic field but horizontally incoming whistlers are occasionally observed. Evidence is given that the wave front cannot be always considered as plane and a five stations network is necessary to ascertain of the planeity of the wave. An electronic computer which can be used to measure the very short transit times associated with short bases 1,000 to 2,000 feet long is described. The performances obtained in laboratory are satisfactory except for a rather small dynamic range. (Author)

AD-418 362 Div. 2, 6, 25
OTS price $2.60

Stanford Electronics Labs., Stanford U., Calif.
RADAR DETECTION OF IONIZED NITRIC OXIDE IN THE LOWER IONOSPHERE,
by L. Colin, A. A. Burns, and V. R. Eshleman.
Apr 63, 24p. Rept. no. SEL63 063; Scientific rept. no. 2
Contract AF19 628 233, Proj. 8653
AFCRL Rept. no. 63 805 Unclassified report

Descriptors: (*Radar signals, Cyclotron waves), (*Cyclotron waves, Detection), (*Ions, Nitrogen compounds), Ionosphere, Oxides.

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

No Entries

4. CHEMISTRY

AD-417 871 Div. 4
OTS price $1.60

Olin Mathieson Chemical Corp., New Haven, Conn.
SOME REACTIONS OF DIALKYLAMINOBORONS.
by T. L. Heying, and H. D. Smith, Jr. 8 May 63, 11p. Technical rept. no. 14
Contract Nonr339500, Task NR356 431
Unclassified report

Presented at the Boron Nitrogen Chemistry Symposium, Duke University, 23-25 Apr 63.

Descriptors: (*Boron compounds, Chemical reactions), (*Boranes, Chemical reactions), (*Organic compounds, Boranes), Aromatic compounds, Organic nitrogen compounds, Organic sulfur compounds, Substitution reaction, O-heterocyclic compounds, Amines, Polycyclic compounds.

Consideration of the established hydroboration, chloroboration and phenylboration reactions prompted attempts to extend this concept to aminoboration. Although addition to ethylenic bonds did not occur, it was found that addition to organic isocyanates and isothiocyanates readily occurred to give the expected boroureas. When applied to boron isocyanates and isothiocyanates however, disproportionations involving the boron substituents prevailed in good yield. Ultimately by such disproportions examples of the novel PhB(NR2)NCX series of compounds were prepared. (Author)

AD-418 105 Div. 4, 14
OTS price $1.60

Naugatuck Chemical Div., United States Rubber Co., Conn.
SYNTHESIS OF REGULATED STRUCTURE POLYPHENYLETHER-SILOXANE BLOCK COPOLYMERS.
Quarterly progress rept. no. 8, 1 May-31 July 63, by Robert MacFarlane, Jr. and Eugene S. Yankura. 31 July 63, 15p.
Contract DA19 020ORD5507
Unclassified report

Descriptors: (*Heat resistant plastics, Synthesis (Chemistry)), (*Silicone plastics, Synthesis (Chemistry)), Silanes, Elastomers, Polymers, Polymerization, Copolymerization, Condensation reactions, Hydroxides, Bromides, Chlorides, Molecular weight.

Copolymers of 4, 4'-dihydroxydiphenylether with diphenyldichlorosilane of comparatively high molecular weight were prepared. Some, which were previously reported to be prematurely cross-linked were found to be soluble in dimethylformamide, and polymerization in this solvent has resulted in completely soluble polymer. This result, with analytical measurements, indicates adequate monomer purity. The preparation of dihydroxypolyphenylethers was attempted by means of the Ullmann condensation reaction between dibromo- and dihydroxyaromatic compounds. Preliminary results indicate that the desired monomers were formed. A condensation by dehydration of hydroquinone resulted in the formation of 4,4'-dihydroxydiphenylether, but no polyphenylether derivatives were detected in the products of this reaction. (Author)

AD-418 217 Div. 4
OTS price $1.10

North Carolina U., Chapel Hill.
THE SYNTHESIS OF NEW INORGANIC MOLECULES.
Final rept.,
by S. Y. Tyree, Jr. 1 Oct 63, 3p.
Contract Nonr85505, Task 052 371
Unclassified report

Descriptors: (*Organic compounds, Scientific research), (*Inorganic compounds, Scientific research), (*Solutions, Scientific research), (*Complex compounds, Scientific research), Synthesis (Chemistry), Chemical reactions, Halides, Organic phosphorus compounds, Light, Scattering, Spectrum (Infrared), Spectrum (Visible and ultraviolet), Thermodynamics, Absorption spectra, Transition elements, Ions, Bibliography.

A series of triphenylphosphonium salts were prepared and characterized. It was found that onium structure is best established by means of absorption spectroscopy. The formation of a wide variety of donor-acceptor was established, showing that such compounds as $TiBr_4$, $SbCl_5$, $MoCl_5$, $SnCl_4$, etc. could act as acids toward a considerable number of bases. In addition, such compounds as R_3AsO and R_3PO were shown to be capable of forming weak field complexes with the simple transition metal ions, similar to the classical aquometal ion complexes. (Author)

AD-418 278 Div. 4
OTS price $1.60

Texaco Experiment Inc., Richmond, Va.
INVESTIGATION OF THE DISSOCIATION CHEMISTRY OF -NF2 COMPOUNDS.
Quarterly summary rept., May-July 63, by U. V. Henderson, Jr., P. L. Goodfriend, H. A. Rhodes and H. P. Woods. 1 Aug 63, 8p.
Rept. no. EXP223; TM1443
Contract NOnr188300
Unclassified report

Descriptors: (*Nitrogen compounds, Fluorides), (*Dissociation, Chemical compounds), (*Chemical compounds, Dissociation), Absorption spectrum, Oxidizers, Synthesis (Chemistry), Spectroscopy, Chemical reactions, Photochemistry, Thermochemistry, Propellants.

AD-418 345 Div. 4
OTS price $1.10

University Coll. of Wales (Gt. Brit.).
VIBRATIONAL FREQUENCIES AND ELECTRONEGATIVITIES,
by R. G. Jones and W. J. Orville-Thomas.
10 June 63, 9p. Technical note no. 3
Contract AF61 052 691
AFCRL 63 859 Unclassified report

Descriptors: (*Organic compounds, Hydrocarbons), (*Deformation, Frequency), Chemical bonds, Molecules, Electron transition, Vibration, Chlorides, Bromides, Iodides, Amides.

Relations are found for the methylene deformation frequencies in CH2XY molecules and the electronegativity product chi(X)chi(Y). These correlations are used (1) to predict 'group' electronegativities for CN, O.CH3, S.CH3, CO.Cl, CO.Br, and CO.NH2; and (2) to predict CH2 frequencies in X.CH2.CN (X = F, Cl, Br, I) molecules. (Author)

AD-418 398 Div. 4, 25
OTS price $2.60

RIAS, Inc., Baltimore, Md.
THEORETICAL AND QUANTUM CHEMISTRY OF BORON COMPOUNDS AND RELATED MOLECULES.
Final rept.,
by Joyce J. Kaufman. 15 Mar 63, 21p.
Contract Nonr347100, Task 356 433
Unclassified report

Descriptors: (*Boron compounds, Quantum mechanics), (*Pentaboranes, Atomic orbitals), (*Complex compounds, Boron compounds), Acids, Bases (Chemistry), Ionization potentials, Mass spectroscopy, Aluminum compounds, Fluorine compounds, Xenon, Chemical bonds, Alcohols, Amines, Ethers, Sulfides, Mass spectrum.

The theoretical boron research project for the Chemistry Branch of the Office of Naval Research has performed research in the development of methods to describe the valence structure, properties and behavior of boron compounds and related molecules. This project has carried out investigations in: (1) Theoretical Study of Charge Transfer Behavior of Boron-Containing Lewis Acid-Lewis Base Addition Compounds, especially those of the type ZB10H12Z. (1) Rigorous Molecular Orbital Calculations of Boron Compounds. (3) Ionization Potentials and Mass Spectral Fragmentation Patterns of Boron Compounds; also the effects of substitution on ionization potentials for cyclic radicals and for O and S compounds. (4) Theoretical Study of Aluminum Coordination Numbers in Various Compounds. (5) Theoretical Aspects of Bonding in Xenon-Fluorine Compounds. (Author)

5. COMMUNICATIONS

AD-418 135 Div. 5, 8
OTS price $8.60

Stelma, Inc., Stamford, Conn.
DEVELOPMENT OF TELETYPEWRITER AND RELAY TEST SETS UGM-1.
Report no. 6 (Final), 25 June 58-31 Jan 63,
by F. Barr. 31 Jan 63, 94p.
Contract DA36 039sc78120, Proj. 3 89 21 723
Unclassified report

Descriptors: (*Test sets, Teletype systems), (*Teletype systems, Test sets), Specifications, Wiring diagrams, Computer logic, Photographs, Transistors, Operation.

Electrical and mechanical developments of the UGM-1 equipments in accordance with Signal Corps Technical requirements SCL-1886, -1887, -1888, includes: (a) Discussions of circuits and components considered for use, during the course of development, and evaluations of the approaches finally chosen for use in the equipment. (b) Design-consideration details and test results that led to electrical and mechanical features incorporated in the equipment. (c) Detailed logic discussions of the final circuitry used in the equipments. (Author)

AD-418 177 Div. 5
OTS price $3.60

Texas Instruments, Inc., Dallas.
A STUDY OF THE FEASIBILITY OF MULTIPLEXING TELETYPE DATA INTO NONSPEECH TIME OF VOCODED SPEECH TRANSMISSION.
Final rept., pt. 3,
by D. R. Ziemer, A. R. Aitken, R. L. Brueck and A. E. Mason, Jr. June 63, 29p.
Contract AF19 628 345, Proj. 4610, Task 461002
AFCRL 63 300 Unclassified report

Descriptors: (*Voice communication systems, Multipath transmission), (*Speech transmission, Coding), (*Speech representation, Coding), (*Teletype systems, Multiplex), (*Speech, Coding), Test equipment (Electronics), Design.

The purpose of this report is to discuss the findings of one phase of Air Force Study Contract AF19(628)-345 wherein Texas Instruments Incorporated was requested by the Data Sciences Laboratory at Air Force Cambridge Research Laboratories to investigate and prepare a separate report on the feasibility of multiplexing teletype data into the silent frames of vocoded speech. Specifically the investigation was to determine (1) the number of teletype transmission channels that might be accommodated (multiplexed) simultaneous with vocoder speech communication system used for speech transmission, (2) the buffer storage requirements to realize the potential teletype transmission rate available due to the silent frames, (3) and the general implementation problem that would be encountered in adding the teletype multiplexing feature into the polymodal vocoder designed and built for AFCRL by Texas Instruments (Contract AF19(628)-302). Results of the study were very significant. (Author)

AD-418 178 Div. 5
OTS price $9.10

Texas Instruments, Inc., Dallas.
EFFICIENT UTILIZATION OF CHANNEL CAPACITY FOR SPEECH COMMUNICATION.
Final rept., pt. 2,
by R. L. Brueck, A. R. Aitken, and D. R. Ziemer.
July 63, 96p.
Contract AF19 628 345, Proj. 4610, Task 461002
AFCRL 63 316 Unclassified report

Descriptors: (*Speech, Communication systems), (*Voice communication systems, Effectiveness), Coding, Theory, Digital computer, Speech compression, Speech transmission.

This report describes a research investigation directed toward more efficient utilization of channel capacity for speech communication. This objective was pursued by a program (1) to theoretically analyze the benefits realized by 'predictive encoding' of vocoded speech sources, (2) to propose and analytically design a model of a typical processing system utilizing predictive coding, and (3) to evaluate the performance characteristics of such a system by simulation with vocoded speech samples on a digital computer. The results were significant in that a compression of 35 to 40 percent was obtained relative to the initial requirements for transmission of the spectrum portion of vocoded speech data. This magnitude of compression can be obtained for essentially real-time transmission and buffer storage requirements of the order of 100 bits.

Compression factors greater than one-half are possible if a time delay in the speech transmission can be tolerated and if additional memory can be supplied. (Author)

AD-418 230 Div. 5
OTS price $11.00

American Electronic Labs., Inc., Colmar, Pa.
CONTROL TECHNIQUES FOR RECEIVERS IN HIGH RF FIELDS,
by J. Waitkeneus, L. Tuttle, L. Johnson, C. Papendick and R. Sugarman. 29 June 63, 1v. AEL Rept. no. 62026 5
Contract AF30 602 2662, Proj. 4540; AEL Proj. 62026, Task 454003
RADC TDR63 354 Unclassified report

Descriptors: (*Radio receivers, Radiofrequency interference), (*Radiofrequency interference, Radio receivers), Circuits, Attenuation, Suppressors, Electric filters, Band-pass filters, Antennas, resonators, Control systems, Intermediate frequency amplifiers, Tuning devices, Bandwidth, Antenna radiation patterns, Rods, Dielectrics, Beams (Electromagnetic).

A number of experimental component and circuit techniques which are applicable in reducing effects of high level interference on receivers were developed and evaluated. Areas of research included band rejection filters, helical resonators, a novel infinite skirt receiving technique, circuit control techniques and antenna techniques. The helical resonator and the circuit control techniques, which included the pass band tuner, the variable bandwidth IF amplifier and a self-synchronous blanker were designed to be compatable with the R361A communications receiver which operates over the frequency range of 225-400 mc. The hollow, dielectric rod antenna was developed and investigated as a new approach for control of beam widths and angular location of pattern nulls. (Author)

AD-418 310 Div. 5, 1
OTS price $11.00

Federal Aviation Agency, Atlantic City, N. J.
EVALUATION OF COCKPIT VOICE RECORDERS.
Final rept.,
by James G. Dong and Ralph A. Russell. May 63, 110p.
Proj. 337 11V
Unclassified report

Descriptors: (*Magnetic recording systems, Voice communication systems), Flight testing, Environmental tests, Speech recognition, Shock resistance, Vibration, Water, Electrical properties, Life expectancy.

Laboratory and flight tests were conducted during the evaluation of cockpit voice recorders. The cockpit voice recorder is an audio recording system for use in recording airplane crew conversations during flight operations under high ambient noise conditions. Tests included measurements of electrical performance, intelligibility, and capabilities of the recording medium to survive a crash environment. (Author)

AD-418 387 Div. 5, 30, 15
OTS price $6.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
PATTERN RECOGNITION AND DETECTION BY MACHINE.
Final rept.,
by Arthur E. Laemmel. 8 Mar 63, 61p. Research rept. no. 1130 63
Contract AF19 628 375, Proj. 4691, Task 469103
AFCRL 63 98 Unclassified report

Descriptors: (*Pattern recognition, Probability), (*Bibliography, Pattern recognition), Radio broadcasting, Radio stations, Spectrum analyzers, Statistical analysis, Errors, Artificial intelligence.

Pattern recognition is considered generally, but emphasis is placed on the following points: optimum estimation of statistical parameters so as to minimize the probability of incorrect classification, non-Gaussian and non-stationary situations, pattern detection in a continuing time series and calculation of error probabilities. Some of the work is specifically directed toward the problem of radio station recognition. A design procedure for pattern recognizing machines is suggested which uses results from this report and other referenced sources. (Author)

6. DETECTION

AD-417 847 Div. 6, 5
OTS price $2.60

Naval Research Lab., Washington, D. C.
PROJECT VANGUARD REPORT NO. 33, MINITRACK REPORT NO. 7 CALIBRATING THE MARK II MINITRACK SYSTEM WITH RADIO STARS AS SIGNAL SOURCES,
by V. R. Simas and G. C. Kronmiller, Jr.
17 Oct 58, 26p.
Proj. NR579 000
NRL Rept. no. 5215 Unclassified report

Descriptors: (*Radio interferometers, Tracking), (*Tracking, Satellites (Artificial)), Extraterrestrial radio waves, Stars, Star trackers, Radio receivers, Calibration, Antenna configurations, Radio signals, Transmission waves.

The Mark II Minitrack System is described briefly and an operational analysis is made. A means of external calibration of the system by tracking radio stars is described and illustrated. Results obtained by this method are presented and compared with results obtained by the complex but more precise method used in calibrating Prime Minitrack stations. It is shown that the tracking of radio stars does in fact provide an adequate system calibration if sufficient data are taken. (Author)

AD-418 082 Div. 6, 25
OTS price $3.60

Magna Corp., Anaheim, Calif.
THIN METAL FILM DETECTION SYSTEM.
Final rept., 15 Dec 62-15 June 63.
15 July 63, 14p. Rept. no. DCN313 7103T6
Contract AF04 611 8527, Proj. 3850
RTD TDR63 1079 Unclassified report

Descriptors: (*Water, Detection), (*Metal films, Nickel), (*Nitrogen compounds, Tetroxides), Resistance (Electrical), Corrosions.

Results are presented of work performed in the

development of thin film sensors for the detection of low concentrations of water in liquid nitrogen tetroxide. The effect of water concentration and temperature on the response rate of the films is presented. Responses, as increase in sensor resistance, of 50 divisions per minute have been obtained for water concentrations of 0.1% by weight. (Author)

AD-418 179 Div. 6, 30
OTS price $3.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
PROBABILITY CHARACTERISTICS OF SENSOR OUTPUT DATA,
by George W. McClure and John C. Dute. Sep 63, 31p. Rept. no. 2900 329R
Contract DA36 039sc78801
Unclassified report

Descriptors: (*Combat surveillance, Photographic analysis), (*Photographic analysis, Statistical distributions), Aerial photography, Photographic reconnaissance, Monitors, Photographic recording systems, Photographic recording media, Infrared photography, Communication theory, Coding, Probability, Resolution, Data processing systems, Analog systems, Digital systems, Statistical analysis, Radar signals, Infrared radiation.

The first results of a program to determine the statistical nature of surveillance sensor output data are presented. Most of the data was obtained from negative transparencies of vertically oriented aerial photographs. Smaller samples of radar and infrared films are reported for comparison. A line-scan process was used to generate an electrical analog of the light transmitted by the film. This signal was sampled, amplitude quantized, and recorded for later statistical analysis by a digital computer. Four statistical parameters were tabulated; specifically, the probability of occurrence of (a) quantized signal amplitudes, (b) quantized slopes between adjacent samples, (c) runs of constant amplitude, and (d) runs of constant slope. Application of the data is discussed in terms of coding and possible improvements in signal processing. Of the four characteristics, only slopes have probability distributions which permit significant reductions (a factor of 2 to 3) in channel capacity. Recommended extensions of the program are related to advanced sensors. (Author)

7. ELECTRICAL EQUIPMENT

AD-417 825 Div. 7
OTS price $1.60

Ray-O-Vac Co., Madison, Wis.
LOW TEMPERATURE BA-2270/U-XLT-I BATTERIES.
Interim rept. no. 4, 15 Aug 61-31 July 62, by J. W. Paulson. 31 July 62, 14p.
Contract DA36 039sc78144, Task 3A99 09 002 02
Unclassified report

Descriptors: (*Low temperature batteries, Performance (Engineering), Lithium compounds, Chlorides, Tests, Storage, Electrical properties, Bromides, Electrolytes, Experimental data, Corrosion.

Twenty-four months delayed testing results are reported for the LiCl:CP-2 low temperature LeClanche system. Discharge tests were run at 70 F., -20 F. and -40 F., after 24 months storage at both 70 F. and 35 F. Problems caused by electrolyte leakage, preferential zinc corrosion, etc., are discussed along with their effect on performance. (Author)

AD-417 856 Div. 7, 12
OTS price $4.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
NEW CATHODE-ANODE COUPLES USING NONAQUEOUS ELECTROLYTE.
Quarterly technical progress rept. no. 3, by H. F. Bauman, J. E. Chilton and G. M. Cook. 15 July 63, 43p.
Contract AF33 616 7957, Proj. 8173, Task 817304 10
Unclassified report

Descriptors: (*Storage batteries, Design), (*Lithium, Electrodes), (*Silver, Electrodes), (*Electrodes, Lithium), (*Electrolytes, Organic solvents), Battery separators, Polarization, Electric potential, Lithium compounds, Aluminum compounds, Chlorides, Organic nitrogen compounds, Freezing, Materials, Electric discharges, Power supplies, Spacecraft.

A lithium-silver chloride cell using a nonaqueous electrolyte system is being studied and has theoretical energy density values of 240w hr/lb and 2.9v open circuit cell voltage. Studies of electrode materials, methods of fabrication and assembly of cell parts, and improved electrolytes are being made. The present report describes the work completed during the second quarter of 1963 and includes the initial results of charge-discharge cycling of five cell-1/2 ampere hour capacity-batteries, further investigation of electrode processes, and initial discharge results of larger capacity cells. (Author)

AD-417 974 Div. 7, 25
OTS price $6.60

General Electric Co., Syracuse, N. Y.
RESEARCH ON THIN FILM INSULATORS.
Interim engineering rept. no. 1, by J. M. Blank, A. E. Cahill, S. W. Ing, V. A. Russell, and W. J. van der Grinten. 24 July 63, 56p.
Contract AF33 657 11079
Unclassified report

Descriptors: (*Films, Electric insulation), (*Electric insulation, Films), (*Silicon compounds, Dioxides), (*Aluminum compounds, Oxides), Electric potential, Capacitance, Microwave frequency, Electrons, Preparation, Thickness, Glow discharges, Measurement, Electric currents, Polyethylene plastics, Electrical properties.

The purpose of this study was to investigate the properties of and the conduction mechanism in very thin insulating films. The methods of preparation of thin insulating films of electroless glow discharge and by base electrode glow discharge were developed and concentrated on production of films between 20-100 Angstroms thick. An analysis of the merits and advantages of these two methods was made and is presented here. A multiple beam interference method of measuring thickness of films below 100 Angstroms was developed. This method should be capable of measuring films below 10 Angstroms. Capacitance and I-V characteristic measurements

were made on a variety of thin film materials. Both pulsed and d.c. methods were used to determine the current voltage relationship. An analysis of these results in terms of Schottky emission and other thermal mechanisms was made, but no definite conclusions regarding the conduction mechanism are presented at this time. (Author)

AD-418 027 Div. 7
OTS price $10.10

Allison Div., General Motors Corp., Indianapolis, Ind.
RESEARCH AND DEVELOPMENT OF AN ADVANCED LABORATORY LIQUID METAL REGENERATIVE FUEL CELL.
Quarterly technical progress rept. no. 2, 19 May-31 Aug 63,
by J. D. Mangus and H. R. KARAS. 9 Sep 63, 1v.
EDR3547; EDR3455
Contract AF33 657 11032, Proj. 8173, Task 817303
Unclassified report

Descriptors: (*Fuel cells, Liquid metals), (*Power supplies, Fuel cells), Electrochemistry, Seals (Stoppers), Design, Ceramic materials, Magnesium compounds, Oxides, Configuration, Compressive properties, Potassium, Mercury, Compatibility, Materials, Spacecraft.

A successful 68-hour seal was produced. All the ceramic materials readily available were investigated for chemical compatibility and mechanical strength. This led to the selection of magnesia as a suitable matrix material. Investigations were also conducted on matrix configurations to determine the most desirable configuration for mechanical strength without sacrificing electrical properties. This led to the selection of a matrix with reinforcing ribs. With these tasks completed, work is now underway to adapt the seal configuration and matrix design to a three-cell unit. In conjunction with this, studies are underway investigating the liquid metal flow problems associated with a three-cell unit, and single cell testing is progressing to demonstrate electrical performance. Preliminary checks of electrochemical properties yielded encouraging results, predicting performances in the 50 to 100 watts/sq. ft. range. (Author)

AD-418 095 Div. 7, 4
OTS price $2.60

Calvin Coll., Grand Rapids, Mich.
SILVER MIGRATION AND TRANSPORT MECHANISM STUDIES IN SILVER OXIDE-ZINC BATTERIES.
Quarterly technical progress rept. no. 5, 1 May-1 Aug 63,
by T. P. Dirkse and L. A. Vander Lugt. 1 Aug 63, 22p.
Contract AF33 657 8689, Proj. 8173, Task 817304 16
Unclassified report

Descriptors: (*Alkaline cells, Silver), (*Batteries and components, Alkaline cells), (*Wet cells, Transport properties), Silver compounds, Zinc, Oxides, Battery separators, Electrolytic cells, Electrodes, Cadmium, Cadmium compounds, Electrolytes, Tracer studies, Polyethylene plastics, Distribution, Experimental data, Halogenated hydrocarbons, Cellulose.

A study was made of the mechanism by which silver is transported in a silver-alkaline battery. This transport appears to take place primarily by diffusion. Two screening tests were devised and tested for determining the tendency of a separator to pick up silver from the electrolyte and also its ability to prevent transport of silver through the material. (Author)

AD-418 098 Div. 7, 4
OTS price $8.10

Mallory Battery Co., North Tarrytown, N. Y.
TESTING AND EVALUATION OF PRIMARY ALKALINE CELLS AND BATTERIES.
Semi-annual rept. no. 5, 1 Aug-15 Mar 63,
by Roger Goodman. 15 Mar 63, 82p.
Contract DA36 039sc78320, Task 3A99 09 002 02
Unclassified report

Descriptors: (*Alkaline cells, Zinc), (*Batteries and components, Primary cells), (*Primary cells, Tests), Storage batteries, Mercury compounds, Oxides, Storage, Performance (Engineering), Data, Tables, Electrochemistry, Electrolytic cells.

The testing and evaluation of primary alkaline cells and batteries of the zinc-alkaline-mercuric oxide system are reported. Initial discharge data for cell types 625R, 1438R and 1450R at temperatures from -20 to 200 F and at 70 F, rates of discharge of 100 hours and less are included. Type 650R cell was introduced and partial initial discharge data are given. Monthly EMF readings for all nine cell types are presented. Delayed discharge after storage at temperatures from -20 to 160 F, was continued on eight cell types. The 650R cell was introduced but no storage data were obtained. (Author)

AD-418 099 Div. 7, 4
OTS price $2.60

Mallory, P. R. and Co., Indianapolis, Ind.
MERCURY CELL BATTERY INVESTIGATION.
Quarterly technical progress rept. no. 1, 15 Dec 60-15 Mar 61,
by J. M. Booe and R. E. Ralston. 15 Mar 61, 21p.
Contract AF33 657 7706, Task 817304
Unclassified report

Descriptors: (*Mercury, Storage batteries), (*Batteries and components, Mercury), (*Electrolytic cells, Mercury), (*Storage batteries, Mercury), Zinc, Potassium compounds, Hydroxides, Mercury compounds, Silver, Oxides, Electrochemistry, Electrodes, Reaction kinetics, Electrolytes, Inorganic compounds, Salts, Battery separators, Aerospace craft, Alkaline cells.

A study of methods and apparatus to accurately determine the volume of gas generated during chemical reactivity rate studies was begun. Inconsistencies were experienced during initial tests, but equipment has been designed which will provide accurate gas volume measurements. An exploratory research cell has been designed, constructed and used with good success. A rigid, pellet type reference electrode was developed for use with this cell. This combination allows rapid determinations of cell electrode parameters. Initial discharge and charge rate determinations were made with both negative electrodes and positive electrodes. A study of the chemical reactivity rate between zinc and electrolyte containing inhibitors was initiated. The methods to be used for determination of separator degradation in the Separator Study phase are presented. The design and use of two experimental test vehicles is discussed. (Author)

AD-418 143 Div. 7
OTS price $4.00

Telecommunications Research Establishment (Gt. Brit.).
SEALED SILVER-CADMIUM BATTERY INVESTIGATION.
Rept. for May 61-May 63,
by James M. Rice. Aug 63, 1v.
Contract AF33 600 42988, Proj. 8173, Task 817304
ASD TDR63 560 Unclassified report

Report on Static Energy Conversion Technology.

Descriptors: (*Alkaline cells, Design), Chelate compounds, Organic compounds, Additives, Silver compounds, Oxides, Gases, Recombination reactions, Potassium compounds, Hydroxides, Silver, Cadmium, Design, Electrodes, Seals (Stoppers), Electrolytes, Seperation, Life expectancy, Tests, Experimental data, Performance (Engineering), Failure (Mechanics).

This report covers a research and development program leading to a long life, deep cyclic, sealed silver-cadmium battery. Organic chelating agents were investigated for their effect on silver-oxide solubility. Organic addition agents were studied for gas recombination. Several separator systems have been evaluated. Test cells were built to evaluate plate designs. A study of the solubility of silver-oxide in potassium hydroxide was made. Seventy-five sealed cells were assembled and tested. Cycle test results and failure analyses have been presented. A test report and prototype specification are included. (Author)

AD-418 189 Div. 7
OTS price $2.60

Union Carbide Consumer Products Co., Cleveland, Ohio.
ALKALINE-MnO2 BATTERY.
Quarterly rept. no. 4, 1 Feb-30 Apr 63,
by J. Winger. 1 July 63, 17p.
Contract DA36 039sc89098, Proj. 1G6 22001A053
Unclassified report

Descriptors: (*Alkaline cells, Manganese compounds), (*Batteries & components, Alkaline cells), (*Primary cells, Manganese compounds), (*Low-temperature batteries, Storage), Oxides, Binders, Battery separators, Plating, Nickel, Tests, Additives, Electrodes, Performance (Engineering), Carbonates, Data.

Re-trials of cathode formulations with binder additives have confirmed the need of a binder for high temperature shelf improvement. Low temperature improvements were less than previous trials; however, this was traced to improper formulation control. The factory trial especially showed specific areas of insufficient liquid content and low cathode density control. Use of Pellon paper in place of Viskon Vinyon and nickel plated cans instead of plain steel cans continue to show advantages at low temperature. Use of nickel plated cans, however, show marginal improvement and their use would have to be justified statistically on a large scale trial. Experimental seal designs have already met minimum standards of 30 days storage, at 160 F., and 90 days storage at 113 F. Continuing data at 113 F. show no sign of leakage at 105 days. (Author)

AD-418 276 Div. 7
OTS price $2.60

Thermo Electron Engineering Corp., Waltham, Mass.
ADDITIVE CONVERTER STUDIES.
Quarterly rept. no. 3,
by S. S. Kitrilakis. Sep 63, 22p. Rept. no. TE11 64
Contract AF33 657 10130
Unclassified report

Descriptors: (*Thermionic converters, Cesium compounds), (*Thermionic emission, Cesium compounds), (*Cesium compounds, Thermionic converters), (*Cesium, Thermionic converters), Vapors, Additives, Corrosion, Rhenium, Molybdenum, Work functions.

A Re emitter- Mo collector converter was tested with Cs and CsF additive. The most significant effect of the CsF observed is a lowering of the collector work function by 0.1 to 0.15 volts. This collector work function reduction is evident in retarding plot measurements and in the increase of the output voltages at the 'knee' of current-voltage curves. The effect of the additive on the work function of the emitter has not been clearly formulated at this time. Under conditions of high power output the emitter work function appears unaffected. At lower Cs pressures, however, an increase in work function is observed for high CsF arrival rates, while low CsF arrival rates result in work functions lower than the Cs-only case. A Re emitter - Mo collector converter was operated for 150 hours with Cs and CsF additive and then subjected to metallurgical examination. The emitter, collector and seal structures were examined and no corrosion attributable to the presence of CsF was detected. (Author)

AD-418 322 Div. 7
OTS price $2.60

General Instrument Corp., Newark, N. J.
SOLAR FLAT PLATE THERMOELECTRIC GENERATOR RESEARCH.
Quarterly rept. no. 2, 1 June-1 Sep 63.
15 Sep 63, 24p.
Contract AF33 657 10335, Proj. 8173, Task 817302
Unclassified report

Descriptors: (*Solar panels, Thermoelectricity), (*Auxiliary power plants, Spacecraft), Design, Optical coatings, Temperature, Structural parts, Thermocouples, Energy conversion, Solar radiation, Metal plates, Pipes, Aluminum, Nickel, Thickness, Weight, Soldered joints, Tests.

A solar flat plate thermoelectric generator consists of a collector plate with an optically selective coating, small size semiconductor thermoelements, a radiator plate and a support structure. Emphasis has been placed on a support structure concept designated as the integral reinforced plate in which radiator and collector plates are folded into self-supporting structures. A number of thermal cycling tests have been conducted up to a maximum of 2000 cycles. (Author)

AD-418 339 Div. 7
OTS price $1.60

Lockheed Aircraft Corp., Van Nuys, Calif.
LITHIUM ANODE LIMITED CYCLE SECONDARY BATTERY.
Quarterly technical progress rept. no. 1,
by H. F. Bauman. 15 Sep 63, 16p.
Contract AF33 657 11709, Proj. 8173, Task 817304
Unclassified report

Descriptors: (*Spacecraft, Power supplies), (*Batteries components, Materials), Electrolytes, Solubility, Organic solvents, Anodes (Electrolytic cells), Cathodes (Electrolytic cells), Lithium, Copper compounds, Cobalt

compounds, Fluorides, Solutions, Electrochemistry, Electrical properties, Electrical conductance, Storage batteries.

Solutions of AlCl(3)-LiCl and NaPF(6) in nitromethane and propylene carbonate have conductivities sufficiently high to make them of interest in this investigation. Such solutions have very low solubilities for CuF(2) and limited solubility for CoF(3). At current densities of 6.25 ma/in squared, lithium anodes show little change in polarization during 70 hour discharges and lithium utilization of over 85%. Cell tests have shown that open circuit voltage of the Li-CuF(2) and Li-CoF(3) couples are close to theoretical and that discharge of cells with these couples has no unexpected difficulties. (Author)

AD-418 348 Div. 7
OTS price $4.60

Battelle Memorial Inst., Columbus, Ohio.
MULTIFUELED THERMAL-ENERGY-CONVERSION SYSTEMS.

Quarterly progress rept. no. 4, 1 Apr-30 June 63. 30 June 63, 42p.
Contract DA36 039SC90838, Proj. 1G6 2201A053 03
Unclassified report

Descriptors: (*Energy conversion, Thermoelectricity), (*Thermoelectricity, Thermionic converters), (*Thermionic converters, Combustion), Heat, Wood, Coal, Cooling, Steam, Boilers, Thermocouples, Generators, Germanium alloys, Silicon alloys, Convection, Temperature, Test methods.

Design studies of 150-watt power sources of simple design, fired with a variety of solid fuels, show that Stirling-cycle unit of 3.1% efficiency should weigh about 22 kg, and a Rankine-cycle unit of 5.7% efficiency should weigh about 15 kg. Efficiencies are based on electric-power output and fuel heating value. Studies of a thermoelectric generator based on Ge-Si technology are incomplete, but indicate that a unit of 3% efficiency should weigh about 5 kg. A simulated thermoelectric generator under test was modified, following which rated heat-absorption rates of 3 kw th were obtained with all fuels. A survey of coal types found in less-developed areas showed that almost all of the coal available is free burning and, thus, suitable for use in burners under study. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-417 812 Div. 8
OTS price $5.60

Marine Engineering Lab., Annapolis, Md.
PRESENTATION TO AIR FORCE HEADQUARTERS, WASHINGTON, D. C. ON THE ELECTROMAGNETIC COMPATIBILITY ANALYSIS CENTER.
27 May 63, 31p.
Unclassified report

Descriptors: (*Electromagnetic waves, Compatibility), Electronic equipment, Radiofrequency interference, Armed forces research, Electromagnetic fields, Analysis, Department of Defense, Radar interference, Radio interference, Mathematical models, Reliability.

The mission of the Electromagnetic Compatibility Analysis Center is to provide to the Department of Defense the analytical capability to determine whether electronic systems will suffer operational degradation due to the absence of appropriate means for rejecting interference. Also to provide a means whereby recommendations may be made which will ensure, insofar as practicable, the capability of electronic systems and equipments to operate in the intended environment at designated levels of efficiency without degradation due to unintentional interference. (Author)

AD-417 817 Div. 8
OTS price $8.10

Photocircuits Corp., Glen Cove, N. Y.
MICROMINIATURE LAYERED PRINTED WIRING.
Quarterly rept. no. 3, 15 Dec 62-15 Mar 63,
by G. Messner, R. McCaw and M. Paluszek.
15 Mar 63, 1v.
Contract DA36 039sc90763, Proj. 3A99 15 002 Task 3A99 15 002 03
Unclassified report

Descriptors: (*Microminiaturization (Electronics), Printed circuits), (*Printed circuits, Modules (Electronics), Copper coatings, Plating, Fixed contacts, Test methods, Dielectric properties, Electric insulation, Manufacturing methods, Sandwich construction, Soldering.

A technique for plating of copper in plated through holes less than .025 in. in diameter and more than two diameters deep has been developed. This technique consists of partial panel and partial pattern plating of the copper. Boards manufactured by this technique exhibited minimum plating buildup and minimum of undercut around the miniature plated through holes with a .002 in. rim around the periphery. Better control of plating currents has also been achieved. The final sequence of manufacturing processes required to produce Microminiature Layered Printed Wiring Test Pattern boards per SCL-7653 specification has been selected and all tooling has been manufactured. A new test pattern has been added for measuring dielectric withstanding voltage and insulation resistance between very closely spaced holes and conductors. A number of preliminary Engineering Samples of all three Test Patterns were tested on an accelerated testing program. Results indicate that the process developed is capable of providing layered printed wiring meeting the requirements of SCL-7653 specification. (Author)

AD-417 819 Div. 8
OTS price $2.60

Marine Engineering Lab., Annapolis, Md.
PRESENTATION BY MR. J. PAUL GEORGI, TECHNICAL DIRECTOR, ECAC TO GREAT LAKES NAVY R&D CLINIC AT OHIO STATE UNIVERSITY, COLUMBUS, OHIO ON 19 JUNE 1963.
19 June 63, 21p.
Unclassified report

Descriptors: (*Electromagnetic waves, Compatibility), Electronic equipment, Radiofrequency interference, Armed forces research, Electromagnetic fields, Analysis, Department of Defense, Spectrum analyzers, Radar interference, Radio interference, Mathematical models, Research program administration.

The mission of the Electromagnetic Compatibility Analysis Center is to provide to the Department of Defense the analytical capability to determine whether electronic systems will suffer operational degradation due to the absence of appropriate means for rejecting interference. Also to provide a means whereby recommendations may be made which will insure, insofar as practicable, the capability of electronic systems and equipments to operate in the intended environment at designated levels of efficiency without degradation due to unintentional interference. (Author)

AD-417 824 Div. 8, 14
OTS price $3.60

Brunswick Corp., Marion, Va.
DEVELOPMENT OF A 1200 DEGREE F RADOME.
Interim engineering rept. no. 1, 1 Apr-30 June 63,
by V. A. Chase and R. L. Copeland. 30 June 63,
1v.
Contract AF33 657 11469, Proj. 4161
Unclassified report

Descriptors: (*Radomes, Materials), (*Materials, Radomes), Aluminum compounds, Phosphates, Fibers, Reinforcing materials, Bonding, Molding, Physical properties, Electrical properties, Mechanical properties, Coatings, Protective treatments, Tensile properties, Impregnation, Glass textiles, Manufacturing methods, High temperature research, Storage, Life expextancy, Dielectric properties, Compressive strength, Plastic coatings, Silicone plastics, Colloids, Acid, Laminates, Aluminum coatings.

The work reported within this document encompasses initial evaluation and study of materials and processes intended to provide data which will allow the design and fabrication of radomes capable of long term service at 800-1200 F. The concept under investigation is based on an aluminum phosphate matrix and fibrous reinforcement. Investigation has been conducted on the effects of different ratios of reactants, curing time and temperature and molding pressures on the aluminum phosphate binder. Various coatings to protect the fibrous reinforcement from degrading effects of the $AlPO_4$ have been evaluated. (Author)

AD-417 855 Div. 8, 2
OTS price $1.60

National Bureau of Standards, Washington, D. C.
A LOG-RESPONSE 5-DECADE A-C OHMMETER,
by H. A. Bowman, L. M. Allison, F. E. Jones and E. T. Woolard. Aug 62, 11p.
Proj. 1404 20 14424
NBS Rept. no. 7552 Unclassified report

Descriptors: (*Ohmmeters, Alternating current), (*Hygrometers, Ohmmeters), Atmospheric sounding, Radiosondes, Humidity, Electron tubes, Transistors, Wiring diagrams, Oscillators.

An a-c ohmmeter developed to enable the barium fluoride film hygrometer element to be test flown in modified AN/AMT-11 radiosondes is discussed. Circuit diagrams are presented and the effects

of temperature and battery voltage on the output of the ohmmeter are discussed. The a-c ohmmeter was modified for use in the humidity experiment on the manned balloon flight, Strato-Lab High No. 5. (Author)

AD-417 874 Div. 8
OTS price $1.60

Microwave Electronics Corp., Palo Alto, Calif.
DEVELOPMENT OF LOW NOISE TRAVELING-WAVE TUBES -- PHASE III --- ENVIRONMENTALIZATION.
Monthly status rept. no. 18, 1 July-1 Aug 63
by A. C. Ashley and W. Raub. Aug 63, 10p.
Contract NObsr81227, Proj. SS021001
Unclassified report

Descriptors: (*Traveling wave tubes, Noise (Radio)), C band, S band, Life expectancy, Environmental tests, X band, Power, Gain, Helixes, Processing, Ceramic materials, L band, Brazing.

Efforts were continued on program to environmentalization low noise traveling wave tubes. The life test of the X-band tube has approached 700 hours. Periodic RF testing has shown that performance is improving with age. A noise figure of less than 11 db and greater than 10 dbm of power was obtained from an L-band vacuum envelope of the 400-volt helix design. Gain was 24 db at 1 Gc, and above 1.3 Gc, 30 db minimum gain was obtained. The helix is to be modified to improve the low-frequency gain. The pin-match processing problem was not completely solved, but worthwhile improvements relative to the braze between the matching pin and the ceramic window were made. (Author)

AD-417 881 Div. 8
OTS price $6.60

Vitro Labs., Silver Spring, Md.
EVALUATION OF ELECTRONIC EQUIPMENT RELIABILITY BY LABORATORY MEASUREMENT.
Summary rept., 1 Apr 57-15 Dec 58.
30 Jan 59, 62p.
Contract NObs72699
Unclassified report

Descriptors: (*Reliability (Electronics), Electronic equipment), (*Electronic equipment, Reliability), Statistical analysis, Radio transmitters, Mathematical prediction, Electronics laboratories, Malfunctions.

The objective of the program described in this report was to measure the reliability of two Bureau of Ships' electronic equipments as experienced in a laboratory installation (Inherent Reliability) and to compare the results of this measurement with the Operational Reliability of the same equipments. The operational reliability was determined from data collected in earlier reliability programs. The inherent reliability of the equipments was determined from analysis of test data collected in the laboratory. Equipment design analysis from a reliability viewpoint was valuable in establishing the correlation between operational and inherent reliability. The results of the comparison indicate that field reliability is directly estimable from results of factory floor testing performed as described. (Author)

AD-417 897 Div. 8
OTS price $1.60

Southwest Research Inst., San Antonio, Tex.
CIRCULAR ARRAYS OF BEVERAGE ANTENNAS FOR HIGH FREQUENCY DIRECTION FINDING.
Interim rept. no. 1, 3 June-3 Sep 63,
by Douglas N. Travers and Paul E. Martin.
23 Sep 63, 14p.
Contract NObsr89345, Proj. SF0010805, Task 9094
Unclassified report

Descriptors: (*Antennas, Direction finding), High frequency, Electronic commutators, Antenna configurations, Coupled antennas, Antenna radiation patterns, Feasibility studies.

Modification of the AN/FRD-10 channel watcher as a D/F receiver and indicator for use with a Beverage array and a 180 input diode commutator is now 100 per cent complete. Plans were initiated in July to make bearing studies on the 112 meter Beverage array (112 meter long antennas spaced 2 degrees), however, a requirement to use the commutating system for specialized tests outside the United States necessitated postponement of these data. Bearing studies will be resumed as soon as the equipment is returned to Southwest Research Institute. Analysis of results obtained on the crossed-over array indicate that experimental investigation of a crossover design may be conveniently carried out at the 112 meter site which now consists of noncrossed-over antennas. This investigation will be concerned with methods of isolation for frequencies above 10 mc in the crossover region. Equations have been derived and programmed for the Institute's digital computer to calculate both azimuth and elevation patterns for various circular sector arrays of Beverage antennas. This program is ready for use and patterns will be completed during the coming interim period. (Author)

AD-417 913 Div. 8, 26
OTS price $2.60

Microwave Associates, Inc., Burlington, Mass.
RUGGEDIZED MICROWAVE DUPLEXING TUBES PRODUCTION ENGINEERING MEASURES PROGRAM.
Quarterly progress rept. no. 5, 12 Mar-12 June 63,
by Paul Basken. 12 June 63, 18p.
Contract DA36 039sc85987
Unclassified report

Descriptors: (*Transmit-receive tubes, Radar duplexers), (*Radar duplexers, Transmit-receive tubes), (*Production, Transmit-receive tubes), Specifications, Tests, Life expectancy, X band.

Efforts were continued on a program to construct and establish capabilities to mass produce microwave duplexing tubes. Product specifications for each of the tube types were written and submitted for approval. Preparations for preproduction testing were completed. Life tests were completed on six tubes, and were started on an additional two. (Author)

AD-417 914 Div. 8
OTS price $8.60

Vitro Labs., Silver Spring, Md.
TECHNIQUES FOR RELIABILITY MEASUREMENT AND PREDICTION BASED ON FIELD FAILURE DATA. ELECTRONIC EQUIPMENT RELIABILITY PROGRAM.
Summary rept. June 53-10 Oct 55.
10 Oct 55, 89p. Technical report no. 80
Contract NObsr63389
Unclassified report

Descriptors: (*Reliability (Electronics), Mathematical prediction), (*Mathematical prediction, Reliability), (*Electronic equipment, Reliability), Statistical analysis, Measure theory, Malfunctions.

The objective is to develop a method for measuring the reliability of electronic equipment and the guide lines by which reliability can be predicted as early as the drawing board. Data used included Bureau of Ships Electronic Failure Reports, supplemented by field observations. The measured reliabilities of selected equipment models were found to be correlatable with the number, type, and application of their components. Predictions based on these rough correlations appear to be of the proper order of magnitude. (Author)

AD-417 939 Div. 8
OTS price $1.10

Adams-Russell Co., Inc., Cambridge, Mass.
QRC-158-6(T) AND QRC-158-10(T).
Monthly progress rept. for 11 Aug-11 Sep 63, by Gordon McKenney. 11 Sep 63, 2p. Rept. no. Q-715
Contract AF33 657 8846
Unclassified report

Descriptors: (*Airplane antennas, Radar antennas), (*Radar antennas, Airplane antennas), Radar jamming, Tests.

AD-417 977 Div. 8
OTS price $1.10

Antenna Lab., Ohio State U. Research Foundation, Columbus.
STUDY OF THERMAL MICROWAVE AND RADAR RECONNAISSANCE PROBLEMS AND APPLICATIONS.
Interim engineering rept., 1 July-30 Sep 60. 1 Oct 60, 5p. Rept. no. 898 11
Contract AF33 616 6158, Task 41131
Unclassified report

Descriptors: (*Radiometers, Effectiveness), Theory, Instrumentation, Temperature, Measurement, Microwave frequency, Thermal radiation, Scattering, Background.

Some problems in the measurement of background radiation and thermal emission from isolated targets at microwave frequencies are discussed. Measurements of sky background temperature at 3 cm show little effect of overcast cover except near the horizon. (Author)

AD-417 994 Div. 8, 26
OTS price $2.60

General Electric Co., Schenectady, N. Y.
PRODUCTION ENGINEERING MEASURE FOR VOLTAGE-TUNABLE MAGNETRONS.
Quarterly progress rept. no. 4, 19 Jan-18 Apr 63, by W. M. Piwnica. 18 Apr 63, 26p.
Contract DA36 039sc86722
Unclassified report

Descriptors: (*Magnetrons, Production), (*Production, Magnetrons), Electric potential, Containers, Noise (Radio), Tuning devices, Manufacturing methods.

Efforts were continued on the development of a production engineering measure for voltage-tunable magnetron types Z-5364 and ZM-6001. Further improvement was made in the packaging process, especially with respect to noise, which was a key problem. Noise performance now appears comparable for both package types. Essentially all engineering work was completed with both package designs. (Author)

AD-418 023 Div. 8
OTS price $2.60

Mitre Corp., Bedford, Mass.
THE RADAR SYSTEMS AND TECHNIQUES DEPARTMENT ADVANCED TECHNIQUES SUBDEPARTMENT.
Rept. for 1 July-30 Sep 62. Sep 63, 21p. Rept. no. PM22 16
Contract AF33 600 39852, Proj. 750
ESD TDR63 441 Unclassified report

Descriptors: (*Pulse compression, Frequency modulation), (*Phase shifters, Delay lines), Design, Radar equipment, Crystal filters, Radar pulses, Sidebands, Pulse generators, Mixers (Electronic), Amplifiers, Computers, Programming (Computers), Data processing systems, Coherent radar, Pulse modulation.

AD-418 031 Div. 8
OTS price $1.60

Motorola Inc., Phoenix, Ariz.
MINIATURE THIN FILM INDUCTORS (MODIFICATION NO. 2).
Interim rept. no. 1, 27 May-31 Aug 63, by F. R. Gleason. 1 Sep 63, 15p. 4003 1
Contract NObsr85397, Proj. SR00803, Task 9636
Unclassified report

Descriptors: (*Coils, Metal films), (*Ferrites, Coils), (*Metal films, Coils), Permeability (Magnetic), Inductance, Miniature electronic equipment, Processing, Manufacturing methods, Gold, Vapor plating, High temperature research, Photoengraving, Vacuum apparatus, Electrodeposition.

Research concerns a program to develop a method for fabricating miniature inductors employing thin-film spiral conductors in combination with bulk-ferrite substrates and deposited ferrite films. The inductance range to be obtained is from 38 to 1000 microhenries with Q-values in excess of 100 measured at 1 mc. The work is organized under two tasks. The first task concerns the development of methods for fabricating spiral conductors from a material that will withstand the rather severe ferrite-film deposition environment. Gold appears to be the suitable material. The development of a method for fabricating spiral coils using photo-resist etch techniques of vacuum and electrodeposited thick films of gold were unsuccessful due to resist failure in the etching solution. Reverse-etch techniques, using a variety of materials to delineate a spiral, were also unsuccessful. A technique is being developed for directly evaporating the spiral coil through two properly aligned metal masks. Presently, this technique is capable of producing air core coils of 0.5 microhenry, and means for increasing coil value to 1.58 microhenries are under investigation. The second task is devoted to the development of compatible processing techniques for manufacturing ferrite films whose properties are reproducible. (Author)

AD-418 091 Div. 8, 30
OTS price $5.60

Stanford Research Inst., Menlo Park, Calif.
ALL-MAGNETIC SHIFT REGISTER SCHEME STUDIES, by E. K. Van De Riet. July 63, 52p. Technical rept. no. 4
Contract Nonr2712 00, Proj. 2697
Unclassified report

Descriptors: (*Electronic switches, Magnetic cores), (*Magnetic core storage, Electrical networks), (*Computer storage devices, Magnetic cores), Computer logic, Programming computers, Mathematical logic.

A method of cataloging and synthesizing all-magnetic shift register circuits is described and demonstrated. The cataloging procedure provides a consistent organization of known schemes, and the synthesis process generates all

possible shift register schemes in a given category. Scheme as used here relates to the sequence of switching of the various elements of a particular configuration to accomplish shifting in a register. The term is defined more completely in the report. The synthesis process was applied to three different configurations of magnetic toroids and wire coupling loops. It was applied only to the three-clock-phase schemes in these configurations. Two new schemes were synthesized in addition to two that were already known. Application of this synthesis technique to more complicated configurations should result in more interesting and more practical circuits. (Author)

AD-418 104 Div. 8
OTS price $2.60

Hoffman Electronics Corp., Los Angeles, Calif.
DEVELOPMENT AND FABRICATION OF ANTENNA GROUP AN/GRA( ).
Quarterly progress rept. no. 2, 1 Apr-1 July 63, by F. C. Carpenter. 1 July 63, 29p.
Contract DA36 039sc90847, Proj. 2X54 02 001
Unclassified report

Descriptors: (*Omnidirectional antennas, Ground vehicle antennas), (*Ground vehicle antennas, Omnidirectional antennas), Ground (Electrical), Tests, Antenna radiation patterns, Attenuation, Performance (Engineering), Standing wave ratios, Helixes, Antenna masts, Shelters, Electric filters, Medium frequency, High frequency, Tuning devices.

Research was continued on the design and development of an efficient antenna system which includes a tunable omnidirectional antenna capable of operating in the frequency range 1.5 to 20 mc, handling 2500 watts of average power, and receiving weak signals. Antenna radiation tests for evaluating the antenna system are described. Evaluation of the counterpoise ground system during high power operation of the antenna is covered. Attenuation and vswr tests of each filter section in the filter assembly are described. (Author)

AD-418 138 Div. 8, 25, 5, 16, 9
OTS price $21.00

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
(No title).
Quarterly progress rept. no. 70, by H. J. Zimmermann and G. G. Harvey. 15 July 63, 371p.
Contract DA36 039sc78108, Task 3 99 25 001 08
Unclassified report

Descriptors: (*Scientific research, Electronics), (*Electronics, Scientific research), (*Plasma physics, Scientific research), (*Communication theory, Scientific research), (*Biophysics, Scientific research), Radio astronomy, Microwave spectroscopy, Infrared spectroscopy, Molecular beams, Nuclear magnetic resonance, Hyperfine structure, Acoustics, Magnetohydrodynamics, Electromagnetism, Fluid dynamic properties, Communication systems, Data processing systems, Language, Neurology.

Contents:
Radio physics
Plasma dynamics
Communication sciences and engineering

AD-418 142 Div. 8, 25
OTS price $3.60

Illinois U. Engineering Experiment Station, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS,
Quarterly progress rept. no. 2, 1 Apr-30 June 63, by J. A. Dayton, Jr., J. T. Verdeyen and L. A. Weaver. 15 July 63, 28p.
Contract DA37 039AMC00066, Task 1G6 22001A055 04
Unclassified report

Descriptors: (*Radar duplexers, Gas discharges), (*Plasma physics, Shock waves), (*Microwave equipment, Electronic switches), Electromagnetic waves, Pressure gages, Measurement, Electric discharges, Velocity, Propagation, Temperature, Ozone.

Sound waves are established in various gases by intense local RF breakdown. The propagation velocity of these waves is measured by means of electrical and electromechanical pressure transducers, and these velocity measurements are used to determine the temperature of the neutral gas in a DC discharge and to study the presence of ozone in RF discharges in air and oxygen. Experimental investigation of the nonlinear interaction of electromagnetic waves with shock waves was initiated during the past quarter. Experiments performed to date indicate that shock velocities to at least Mach 15 can be produced in the experimental apparatus. (Author)

AD-418 145 Div. 8
OTS price $10.50

Syracuse U., Coll. of Engineering, N. Y.
MECHANISMS OF FAILURE IN SEMICONDUCTOR DEVICES. Final rept.,
by Glenn M. Glasford, W. Howard Card, Richard L. Anderson, and Rajendra P. Nanavati. Sep 63, 123p.
EE959 630TDR1
Contract AF30 602 2778, Proj. 5519, Task 551902
RADC TDR63 338 Unclassified report

Descriptors: (*Reliability (Electronics), Semiconductor devices), (*Semiconductor devices, Malfunctions), Noise (Radio), Extremely low frequency, Correlation techniques, Gallium compounds, Arsenides, Tunnel diodes, Infrared radiation, Electric currents, Electrical properties, Statistical distributions, Statistical analysis, Theory.

Extensive studies of low-frequency noise in resistors and semiconductor devices have been made for the express purpose of exploring any correlation between low-frequency excess noise and device deterioration or other anomalous behavior. New techniques for making noise measurements have made it possible to distinguish between two types of noise, one which is more or less regular which has been called clean noise and the other called burst noise which is irregular and statistically nonstationary. Present results indicate that burst noise is associated with chemical processes and is related to drift of electrical parameters. It is tentatively concluded that burst noise is also related to irreversible processes which are precursors of device failure, although further studies are required to definitely establish this connection. Further studies have been made of gallium arsenide tunnel diode failure. Infrared radiation from diodes biased in the injection region has been measured and related to true injection current. The voltage-current characteristic of a number of diodes as a function of time have been recorded. From these measurements a quantitative relationship among radiation, injection current and degradation rate has been established. (Author)

AD-418 154 Div. 8
OTS price $3.60

Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
MODULAR DESIGN OF IMPROVED SOLAR CONVERTERS.
Quarterly progress rept. no. 7, 1 Dec 62-28 Feb 63,
by William J. Moriarty. 28 Feb 63, 1v. Rept. no. HSER2667
Contract DA36 039sc87461, DA Proj. 1G622001A053 03
Unclassified report

Descriptors: (*Solar panels, Modules (Electronic)), (*Solar cells, Manufacturing methods), Silicon, Molding, Bonding, Electric currents, Electric potential, Plastics, Acrylic resins.

Three important tests were conducted during this period: (1) a temperature gradient test of the prototype module; (2) a molded shingle assembly shear test; and (3) a current versus voltage output of the active module. Relative to the Special Warfare conceptual design, drawings of a markedly different more advanced array were completed. USAELRDL suggested that detailed sketches of this concept be developed for further evaluation. A wiring layout and calculations for the electrical design of the active 5-watt module were developed which indicate the number of cells per series string, total number of cells, electrical output, and physical size. Light transmission tests were performed on the materials listed in the previous report which were subjected to ultra-violet and sunlight exposure. An evaluation of the additional cover materials also listed in the same report has been made based on light transmission lossess and literature analysis. (Author)

AD-418 162 Div. 8
OTS price $2.60

Aircraft Armaments, Inc., Cockeysville, Md.
SIX-CHANNEL AMPLIFIER ASSEMBLY.
Final rept.
June 63, 20p. Rept. no. ER2918, R
Contract FAA ARDS491, Proj. 111 3
Unclassified report

Descriptors: (*Audio amplifiers, Transistors), (*Transistor amplifiers, Audiofrequency), Design, Wiring diagrams, Gain, Power amplifiers, Power supplies.

This engineering report summarizes the design and development performed for the Communications Branch of the Federal Aviation Agency. The result of the work was delivery of 5 prototype units of a high-reliability six-channel transistorized audio amplifier assembly, meeting all requirements of the specification for Project 111-3. Each assembly houses six independent amplifier modules with a frequency response from 300 to 3,000 cps and a gain of 53 db. The assembly also contains two redundant power supplies in the 7-in. high standard relay panel. (Author)

AD-418 165 Div. 8, 7
OTS price $14.00

IIT Research Inst., Chicago, Ill.
INSTRUMENTATION AND MEASUREMENT TECHNIQUES STUDY.
Final progress rept., 1 Feb 59-31 Mar 63,
by A. T. Ashby. 31 Mar 63, 1v. Rept. no. ARF5112F
Contract DA36 039sc78269, DA Proj. 3G89 01 021 01; ARF Proj. E112
Unclassified report

Descriptors: (*Electrical equipment, Measurement), (*Checkout equipment, Electrical equipment), (*Test equipment (Electronics), Checkout equipment), Electronic equipment, Circuits, Programming (Computers), Magnetic recording systems, Phase shifters, Ferrites, Printed circuits, Real time, Automatic, Calibration, Transmission lines, Modules (Electronics), Waveform generators, Magnetic cores, Instrumentation, Fiber optics.

This study is aimed at advancing the state-of-the-art of electrical measurements, and directed toward the examination of current and recent research findings in the physical sciences for exploitation in electrical measurements and instrumentation. The new techniques developed due to the scope of the program are intended for ultimate use in the development of improved military electronic test equipment. (Author)

AD-418 169 Div. 8
OTS price $2.60

Microwave Associates, Inc., Burlington, Mass.
MAGNETICALLY CONTROLLED GAS DUPLEXER.
Quarterly progress rept. no. 1, 27 Feb-27 May 63,
by C. S. Ward and M. A. Allen. Sep 63, 23p.
Contract AF30 602 2960, Proj. 5573, Task 557301
RADC TDR63 336 Unclassified report

Descriptors: (*Radar duplexers, S band), (*Transmit-receive tubes, Ionization), Magnetic fields, Electric arcs, Partial differential equations, Mathematical models, Waveguide windows, Waveguide circulators, Electric discharges, Waveguide irises, Quartz, Electric fields.

An experimental setup for making measurements of discharge arc loss in a magnetic field is described in detail. Attempt is made to explain recovery time reductions in a transverse magnetic field by calculating the fractional power transmitted into a magnetized semi-infinite plasma. The resulting theoretical reductions are much smaller than those observed experimentally. (Author)

AD-418 170 Div. 8
OTS price $4.60

RADCOM-Emertron Div., Litton Systems, Inc., Silver Spring, Md.
FREQUENCY TUNING BY PARAMAGNETIC RESONANCE,
by Michael S. Granieri, Jr. Aug 63, 37p.
Contract AF30 602 2938, Proj. 4505, Task 450501
RADC TDR63 258 Unclassified report

Descriptors: (*Nuclear magnetic resonance, Tuning devices), (*Band-pass filters, High frequency), Feasibility studies, Nuclear magnetic moments, Paramagnetic resonance, Circuits, Detectors, Polarization, Masers, Protons, Nuclear spins.

Work was begun to determine the feasibility of using the nuclear magnetic resonance phenomenon in a tunable, variable bandpass filter in the 3 to 30 Mc range. Various parameters of the NMR phenomenon were surveyed in the light of the desired filter characteristics, and lines of approach were decided upon. Equipment has been designed and assembled to permit a flexible test program to be carried out. (Author)

AD-418 171 Div. 8
OTS price $8.10

Coordinated Science Lab., U. of Illinois, Urbana.
SYNTHESIS OF SOME DISTRIBUTED RE NETWORKS,
by Cassius A. Hesselberth. Aug 63, 71p. Rept. no. R164
Contract DA36 039 TR US AMCO2208, DA Proj. 3A99 25 004
Unclassified report

Descriptors: (*Electrical networks, Resistors), (*Circuits, Capacitors), Theory, Mathematical analysis, Complex variables, Electrical impedance, High pass filters, Low pass filters, Sandwich construction, Dielectric films, Metal films.

A certain distributed RC structure can be used to obtain rational open-circuit transfer impedances. In addition, one of the driving-point impedances turns out to be rational. Hence, one of the open-circuit voltage transfer functions is also rational. Furthermore, by considering various subcircuits and distributions of resistance and capacitance it is possible to realize other rational open-circuit voltage transfer functions and rational short-circuit transfer admittances. Connecting these networks in series extends the class of functions realizable with such structures. Using a basic distributed RC network along with an external resistor and capacitor, it is possible to obtain a null in the open-circuit voltage transfer function over a certain restricted range of frequencies. However, the shape of the notch is shown graphically to be a function of the null frequency. A lossy dielectric in the distributed network is found to shift this range of frequencies upwards and alter the notch characteristics in much the same way as in the low-pass filter. (Author)

AD-418 172 Div. 8, 15
OTS price $6.60

Coordinated Science Lab., U. of Illinois, Urbana.
ON NETWORKS AND BI-COMPLETE GRAPHS,
by James A. Resh. July 63, 63p. Rept. no. R174
Contract DA36 039TR US AMC02208E, Proj. 3A99 25 004
Unclassified report

Descriptors: (*Networks, Theory), Matrix algebra, Communication theory, Potential theory, Circuits, Capacitance, Inequalities, Equations, Groups, Transformations (Mathematics), Topology, Sequences, Numbers, Functions, Combinatorial analysis.

Mathematically, a communication network is a network (bi-complete linear graph) whose edge weights are restricted to be nonnegative. In the physical interpretations which generated this interest, the property which occupies the center of attention is the capacity of the network for supporting a flow from one terminal to another. It is this preoccupation with ''generalized plumbing'' that distinguishes the theory of communication networks from other mathematical systems dealing with weighted graphs. (Author)

AD-418 173 Div. 8
OTS price $2.60

Coordinated Science Lab., U. of Illinois, Urbana.
DESIGN AND PERFORMANCE OF A POLARITY COINCIDENCE DETECTOR,
by M. Raether and D. Bitzer. Aug 63, 25p. Rept. no. R178
Contract DA36 039TR US AMC02208E, Proj. 3A99 25 004
Unclassified report

Descriptors: (*Demodulators, Synchronization (Electronics), (*Test equipment (Electronics), Demodulators), Signal to noise ratio, Correlation techniques, Coincidence counting, Equations, Special functions, Wiring diagrams.

A synchronous detector based on the polarity coincidence principle has been constructed and tested. The theory of operation is discussed with special emphasis on the influence of correlation between samples and the influence of error sources. Details of the construction are presented and test results are discussed. The present instrument works in the range of 20 c/sec to 20 Kc/sec and is capable of measuring signal-to-noise ratios as low as 10 to the -4th power. It has been in constant laboratory use for several months and has proven to be a very reliable tool for the synchronous measurement of small ac signals. (Author)

AD-418 186 Div. 8
OTS price $5.60

Melpar Inc., Falls Church, Va.
RESEARCH DIRECTED TOWARD THE DEVELOPMENT OF A LOW-ENERGY ELECTRON GUN.
Final rept.,
by Otis T. Inge, Leedy G. Ambrose and Roger C. Jones. Sep 63, 47p.
Contract AF19 628 1650, Proj. 8658
AFCRL 63 698 Unclassified report

Descriptors: (*Electron guns, Spectrum analyzers), Space charges, Electron beams, Electrons, Energy, Electric currents, Cathodes (Electron tubes).

A low-energy electron gun of high current intensity was designed and developed, which will transmit 140 microamperes at 10 volts over a drift distance of 1 cm. The energy spread at half-height is less than a volt. Theoretical limits on the allowed current densities were formulated and verified experimentally within a factor of five. Space charge effects in electron beams were considered with respect to producing a monoenergetic beam. Electron beams with currents over a milliampere and potentials less than a few volts require cross sectional areas that are prohibitive if the beam is transmitted over distances greater than a centimeter. Other considerations as to the design of a high-intensity, low-energy electron spectrometer are reviewed. (Author)

AD-418 192 Div. 8
OTS price $4.60

Arinc Research Corp., Washington, D. C.
SYSTEM RELIABILITY PREDICTION BY FUNCTION.
VOLUME II - PREDICTION PROCEDURE.
Aug 63, 43p.
Contract AF30 602 2838, Proj. 5588, Task 558802
RADC TDR63 300, Vol. 2 Unclassified report

Descriptors: (*Reliability (Electronics), Mathematical prediction), (*Ground support equipment, Reliability), (*Mathematical prediction, Reliability, Electronic equipment, Design, Statistical analysis, Malfunctions.

A step-by-step procedure for predicting the reliability of Air Force Ground electronic systems during the pre-design stage is presented. Methods are outlined for predicting both a point value of the system mean time between failures, and a 95% confidence interval around this value. The reliability equations associated with the procedure appear in four forms; the form to utilize depends on the type of information available. Inputs to the prediction equations are data on certain system parameters, as defined herein. (Author)

AD-418 207 Div. 8, 25
OTS price $4.60

CBS Labs., Stamford, Conn.
DEVELOPMENT OF PHOSPHOR SCREENS FOR HIGH RESOLUTION DISPLAY DEVICES.

Interim rept. no. 1, Mar-Sep 63,
by R. Rutherford, Jr. and P. Grosso. Sep 63, 29p.
Contract AF33 657 10632
Unclassified report

Descriptors: (*Cathode ray tube screens, Display systems), (*Display systems, Phosphorescent materials), (*Phosphorescent materials, Cathode ray tube screens), Electrophoresis, Emissivity, Evaporation, Zinc, Stainless steel, Vapor plating, Magnesium, Luminescence, Physical properties, Electrical properties, X-ray diffraction analysis, Glass, Electrodes, Calcium compounds, Magnesium compounds, Oxides, Silicates, Colloids, Powders, Salts, Electron bombardment, Excitation, Resolution, Optical equipment, Cathode ray tubes, Phosphorescence.

This report covers the first six months of a project concerned with the use of cataphoresis to deposit high quality phosphor screens for cathode ray tubes. Phosphor screens (P-16) with resolutions exceeding 80 line pairs per millimeter have been cataphoretically deposited on glass using intermediate zinc coatings which were subsequently removed by evaporation. Chemical composition and spectral emission characteristics for cataphoretically deposited powders were found to be similar to the starting material indicating no changes were caused by the deposition process. Qualitative spectrometer measurements indicate an increase in radiant efficiency of the cataphoretic P-16 screen in relation to that of the settled P-16 screen. (Author)

AD-418 231 Div. 8
OTS price $1.10

Electromagnetic Technology Corp., Palo Alto, Calif.
FREQUENCY CONVERTER UNITS FOR L-BAND, S-BAND, C-BAND AND X-BAND.
Interim development rept. no. 2, 1-31 Aug 63.
18 Sep 63, 9p.
Contract NObsr89536, Proj. SF0100201, Task 9294
Unclassified report

Descriptors: (*Frequency converters, Microwave frequency), (*Microwave frequency, Frequency converters), Frequency multipliers, Frequency dividers, L-band, S-band, C-band, X-band, Ultrahigh frequency, Superhigh frequency, K-band, Klystrons, Band-pass filters, High-pass filters, Semiconductor devices, Oscillators, Crystals.

Research was continued on the disgn and development of up and down frequency converter units between L-, S-, C- and X-bands and a band near 35 Gc. Each unit will contain a local oscillator as well as linear passive frequency selective elements and nonlinear solid state elements for performing frequency conversion. The formal literature search was completed. Two klystron local oscillators and a conventional crystal converter unit were ordered. Several crystal units have already been secured. Preliminary designs of a band-pass and a high-pass filter were made, and corresponding filter models are being fabricated. Also see AD-418 265. (Author)

AD-418 255 Div. 8
OTS price $3.60

Philco Corp., Blue Bell, Pa.
THIN FILM ACTIVE DEVICES.
Quarterly rept. no. 3, 22 Dec 62-22 Mar 63,
by James P. Spratt. 22 Apr 63, 33p.
Contract DA49 186ORD1056
Unclassified report

Descriptors: (*Semiconductor devices, Electrons), (*Films, Dielectric films), Electron beams, Electron guns, Diodes (Semiconductors), Solid state physics, Germanium, Cadmium compounds, Sulfides, Aluminum compounds, Oxides.

The experiment aimed at determining both the mean free path of a directed beam of hot electrons and the efficiency of collection of such a beam has been set up, and the electron gun and target assemblies are being calibrated. Preliminary runs should begin during the next quarter. Studies were continued of the metal-thin insulator-semiconductor diode system as a possible high efficiency collector of hot electrons. Visible light emission was observed from such diodes at 77 K under forward bias, and is being attributed to electron-hole recombination in the CdS. The hole is felt to be generated by electron tunneling from the valence band of the semi-conductor to the metal. Fabrication of MEA structures on single-crystal germanium collectors was continued. A quartz crystal oscillator is being installed to monitor the thickness and deposition rate of the reactively evaporated Al2O3 layer. Temperature dependence of g sub m for MEA devices was obtained and it was found that these devices are exceptionally stable over a wide temperature range. Preliminary frequency response data taken point up the need for much reduced line widths to cut down parasitic capacitance effects. (Author)

AD-418 265 Div. 8
OTS price $1.10

Electromagnetic Technology Corp., Palo Alto, Calif.
FREQUENCY CONVERTER UNITS FOR L-BAND, S-BAND, C-BAND AND X-BAND.
Interim development rept. no. 1, 1-31 July 63.
17 Sep 63, 8p.
Contract NObsr89536, Proj. SF0100201, Task 9294
Unclassified report

Descriptors: (*Frequency converters, Microwave frequency), (*Microwave frequency, Frequency converters), L band, S band, C band, X band, K band, Ultrahigh frequency, Superhigh frequency, Frequency multipliers, Frequency dividers, Oscillators, Semiconductor devices.

Research concerns the design and development of up and down frequency converter units between L, S, C, and X bands and a band near 35 Gc. Each unit will contain a local oscillator as well as linear passive frequency selective elements and nonlinear solid state elements for performing frequency conversion. A literature search was initiated and requests for technical information started. Also see AD-418 231. (Author)

AD-418 267 Div. 8
OTS price $5.60

General Electric Co., Owensboro, Ky.
DEVELOPMENT OF AN IMPROVED JAN 6299.
Quarterly progress rept. no. 6, 1 Jan-31 Mar 63,
by D. L. Cook. 31 Mar 63, 55p.
Contract DA36 039SC85953
Unclassified report

Descriptors: (*Electron tubes, Manufacturing methods), (*Manufacturing methods, Electron tubes), Tests, Experimental data, Tables, Temperature control, Vacuum seals, Cathodes (Electron tubes), Vacuum apparatus, Aging (Materials), Metal coatings, Life expectancy, Humidity, Sealing compounds, Electrical properties.

Efforts were continued on a program to evaluate certain areas of advanced tube manufacturing techniques and apply them where feasible to

JAN 6299 to result in a more reliable and better performing tube. The status of the program is summarized. Test results and data on 24 engineering samples are presented. (Author)

AD-418 270 Div. 8
OTS price $2.60

Airborne Instruments Lab., Inc., Deer Park, N. Y.
BOARD-BAND LOW-NOISE AMPLIFIER.
Final rept., 27 Apr-31 Aug 63,
by D. Neuf and P. Lombardo. 1 Sep 63, 22p.
Contract NObsr87556, Proj. SR008 03 01, Task 9391
Unclassified report

Descriptors: (*Parametric amplifiers, Varactor diodes), (*Varactor diodes, Parametric amplifiers), Broadband, Ultrahigh frequency, Superhigh frequency, S band, Noise (Radio), Tests, Bandwidth, Gain, Temperature, Capacitance, Performance (Engineering), Tuned circuits, Pumping (Electronics).

Research concerned development of broadband, low-noise varactor diode parametric amplifiers. Four engineering breadboards of a low-noise small-signal amplifier were fabricated and tested. The electrical characteristics for one typical unit are: Noise factor, 2.7 db midband 3.5 db band edges; Bandwidth, 1.0 Gc (41%); Center frequency 2.45 Gc; Gain, 18 db ± 2 db; Dynamic range, 85 db (1-Mc bandwidth); Saturation, -20 dbm for 1-db departure from linear operation; and Varactor temperature, room temperature (290 K). Further improvements in performance are possible--especially if varactor diodes with greater nonlinearities and lower stray capacitances are used. (Author)

AD-418 283 Div. 8, 26
OTS price $3.60

General Electric Co., Owensboro, Ky.
DEVELOPMENT OF AN IMPROVED JAN 6299.
Quarterly progress rept. no. 7, 1 Apr-30 June 63,
by D. L. Cook. 30 June 63, 30p.
Contract DA36 039SC85953
Unclassified report

Descriptors: (*Manufacturing methods, Electron tubes), (*Electron tubes, Production), Glass seals, Temperature, Cathodes (Electron tubes), Humidity, Vacuum apparatus.

The purpose of this contract is to evaluate certain areas of advanced tube manufacturing techniques and apply them where feasible to JAN 6299 to result in a more reliable and better performing tube. The objective is to obtain operation at a tube temperature rating of 225 C. The areas under investigation are: (1) improved alignment, concentricity and ceramic strength; (2) improved anode to ceramic seal; (3) temperature control at exhaust; (4) improved application of cathode coating; (5) improved cathode mounting; (6) improve processing for higher temperature operation; (7) improvement in humidity testing; (8) improved exhaust fixturing; and (9) extended life test and tube failure analysis. (Author)

AD-418 307 Div. 8, 25
OTS price $2.60

Stanford Electronics Labs., Stanford U., Calif.
ON A REMARKABLE CORRELATION BETWEEN WHISTLER-MODE PROPAGATION AND HF NORTHSCATTER,
by George B. Carpenter and Lawrence Colin.
June 63, 26p. TR4 and 2; SEL63 082
Contracts AF19 628 233 and Nonr22527
AFCRL 63 692 Unclassified report

Descriptors: (*Whistlers, Propagation), (*Radio waves, High frequency), Ionospheric propagation, Very low frequency, Refraction. Wave transmission.

The simultaneous occurrence of whistler-mode and northscatter echoes monitored at Stanford University is examined. The important result of the analysis is the direct evidence of meter scale field-aligned irregularities in that portion of the F region through which whistler-mode signals are believed to have passed. These irregularities may be related to the field-aligned ducts which have been postulated to explain whistler-mode propagation. (Author)

AD-418 334 Div. 8
OTS price $1.60

Technical U., Copenhagen (Denmark).
FRESNEL ZONES FOR GROUND-BASED ANTENNAS,
by J. Bach Andersen. Apr 63, 17p. Technical note no. 5
Contract AF61 052 503
AFCRL 63 359 Unclassified report

Descriptors: (*Antenna radiation patterns, Ground (Electrical), (*Radio fields, Antenna radiation patterns), (*Antennas, Antenna radiation patterns), Electrical conductance, Intergral equations, Special functions (Mathematical), Attenuation, Equations, High frequency, Very high frequency.

The ordinary Fresnel zone concept is extended to include the influence of finite ground conductivity. This is important for ground-based antennas because the influence on the radiation pattern of irregularities near the antenna is determined by the amplitude and phase of the groundwave. Only discontinuities of the electrical parameters of the ground are considered. Extensive numerical results for the first Fresnel zone are given, and it is shown that the zone is much smaller for a finite conductivity than for an infinite conductivity, especially for small angles of elevation. (Author)

AD-418 336 Div. 8
OTS price $1.10

Innsbruck U. (Austria).
PROPAGATION OF VLF WAVES IN LIQUID AND SOLID MEDIA,
by W. Bitterlick. 1 July 63, 6p. Technical note no. 1
Contract AF61 052 490
AFCRL 63 353 Unclassified report

Descriptors: (*Very low frequency, Propagation), (*Propagation, Models (Simulations)), (*Models (Simulations), Electromagnetic waves), Radiofrequency, Electrical conductance, Dielectric properties, Solids, Liquids, Equations, Antenna radiation patterns.

Modeling studies with constant conductivity are possible only within very small limits which in turn depend on the conductivity. If the conductivity is also modeled, laboratory measurements are necessary the spatial limitation of which results in excessively high model conductivity. (Author)

AD-418 341 Div. 8
OTS price $2.60

Westinghouse Electric Corp., Baltimore, Md.
DEVELOPMENT OF THE MIRRECHON SIGNAL STORAGE TUBE.
Quarterly rept. no. 1, May-July 63,
by A. S. Jensen, M. P. Siedband, and E. F. Wood.
July 63, 21p.

Contract NObsr89303, Proj. SR008 03 04, Task 9486
Unclassified report

Descriptors: (*Signals, Storage tubes), (*Storage tubes, Signals), Electroforming, Design, Production, Electron optics, Electronic equipment, Lenses, Tests, Electron multipliers.

Westinghouse Electric Corporation is continuing the development of the WX-3867 Mirrechon Signal Storage Tube. This report discusses the progress made in the assembly and initial trials of the electron optical bench, the ruling of a master grating and replication experiments, initial studies made on the secondary emission multiplier section and the design of the electronic test equipment. (Author)

AD-418 363 Div. 8
OTS price $6.60

Chu Associates, Framingham, Mass.
VOLUMETRIC FIXED APERTURE RADAR SCANNING ANTENNAS,
Final rept.
by M. Eovine and G. Ploussios. 25 June 63, 55p.
Contract AF19 604 4994, Proj. 4600, Task 460007
AFCRL 63 307 Unclassified report

Descriptors: (*Lens antennas, Coupled antennas), (*Antenna configurations, Scanning), (*Antenna feeds, Electronic scanners), (*Radar antennas, Scanning), Antenna radiation patterns, Phase measurement, Electrical properties, Measurement, Design, Theory.

R-2R lens feed systems for scannable circularly symmetric arrays are described. Use of the basic lens for feeding large arrays scannable over large volumes is discussed. Various lens system designs demonstrating feasibility of the lens as a means of providing proper phase and power distribution for circular symmetric arrays are described. Phase, amplitude and insertion loss measurements are presented. In addition, radiation patterns obtained from circular arrays fed with various R-2R lens designs are included. (Author)

AD-418 365 Div. 8
OTS price $2.60

Zenith Radio Corp., Chicago, Ill.
DEVELOPMENT OF A HIGH FREQUENCY ELECTRON-BEAM PARAMETRIC AMPLIFIER.
Quarterly progress rept. no. 7, 1 Jan-31 Mar 63,
by Peter G. Everett and Charles G. Nelson.
31 Mar 63, 24p.
Contract DA36 039sc88915, Proj. 196 222001A005 04
Unclassified report

Descriptors: (*Electron tubes, Parametric amplifiers), (*Parametric amplifiers, Electron beams), (*Microwave amplifiers, Noise (Radio)) L band, S band, Electron guns.

In an attempt to reduce the noise recently measured in the two Kompfner-dip coupler tube, the original gun, which contained a large cathode and two current-intercepting anodes was replaced by a non-intercepting Pierce gun. Measurements made on this tube with the recently obtained lower noise figure receiver have shown improved but still unacceptable noise levels at the output coupler after noise cancellation. Further theoretical considerations on this noise are presented in an appendix. A 400 mc non-degenerate amplifier tube designed to investigate, and hence minimize, excess noise from longitudinal velocity spread has been constructed and has an unexpectedly high noise figure of 6.5 db. Reasons for the discrepancy are being investigated. (Author)

AD-418 367 Div. 8
OTS price $1.60

Electronic Defense Lab., Mountain View, Calif.
SIDE-LOBE POWER-LEVEL PROBABILITIES FOR MATCHED AND UNMATCHED POLARIZATIONS,
by Raymond E. Franks and Charles F. Hummel.
22 Apr 63, 10p. Technical memo. no. EDL M560
Contract DA36 039AMC00088E
Unclassified report

Descriptors: (*Parabolic antennas, Antenna lobes), (*Antenna lobes, Parabolic antennas), Antenna radiation patterns, S band, Polarization, Probability, Reflectors.

This investigation analyses antenna side-lobe radiation pattern measurements of a particular parabolic reflector-type antenna system to establish side-lobe power-level probabilities for both linearly and circularly ''matched'' and ''unmatched'' polarization. A basic, simplifying approximation was made, namely, that a principal plane pattern is essentially a ''figure of revolution'' about the main-beam axis. Three regions away from the main beam were considered: the angular region from the first side-lobes to ±30 degrees, from ±30 to ±90 degrees, and from ±90 to ±180 degrees. Test results disclosed that within the first angular region, coupling with an incident wave either matched to or orthogonally polarized to the main-beam polarization produced similar results. Within the second and third angular regions, reasonably close correlation of side-lobe power levels was obtained between linearly matched and opposite circular-sense conditions; similarly, linear cross-polarized coupling behaved like circular same-sense coupling indicating that in the far-out regions the principal source of side-lobe power was spill over from the feed. (Author)

AD-418 373 Div. 8, 6
OTS price $1.00

Navy Electronics Lab., San Diego, Calif.
AUDIO FREQUENCY GENERATORS USING SILICON CONTROLLED RECTIFIERS. POWER INVERTERS THAT DELIVER 0.5-MEGAWATT PULSES, AT 10 TO 700 C/S, FROM DC OR THREE-PHASE AC SOURCES,
by J. T. Redfern. 17 July 63, 20p.
NEL Development rept. 1175 Unclassified report

Descriptors: (*Inverters, Diodes (Semiconductor)), (*Switching circuits, Diodes (Semiconductor)), (*Diodes (Semiconductor), Inverters), Electric currents, Transducers, Sonar, Extremely low frequency, Silicon, Wiring diagrams, Capacitors.

The two SCR inverters developed afford considerable weight and volume advantages over conventional ac power supplies. They can deliver 0.5-megawatt pulses in the frequency range from 10 to 700 c/s. These inverters use commercially available 200- and 400-ampere SCR's. Recently, 800 ampere units have been introduced; use of these would permit the construction of inverters with even greater size advantages. Sea tests with the dc inverter have proved satisfactory. The more recently completed ac-rectifier inverter has not yet been subjected to field trials. In view of their size advantages, it is recommended that further development of these SCR inverters be undertaken to convert them into Fleet operational equipment. (Author)

9. FLUID MECHANICS

AD-417 800 Div. 9
OTS price $3.60

Harry Diamond Labs., Washington, D. C.
FLUID AMPLICATION. 7. A THREE - STAGE DIGITAL AMPLIFIER,
by Carl J. Campagnuolo. 1 Aug 63, 38p.
Proj. 31131
HDL TR1106 Unclassified report

Descriptors: (*Amplifiers, Fluid flow), Hydraulic systems, Pneumatic systems, Design, Performance tests, Gain, Power amplifiers, Measurement, Feedback, Pressure, Feedback amplifiers, Nozzles, Pressure, Digital systems, Jet mixing flow, Boundary layer.

The design and performance of a three-stage digital amplifier system obtaining a high-power output and flow gain is described. The design of the system was arrived at by taking measurements of single elements and matching the units with respect to input, output, and feedback performance. Flow gain in the system was obtained by increasing the nozzle widths by a factor of ten from stage to stage. Effects of loading on the stability of intermediate units were controlled by positioning the splitters further downstream than would be required for maximum efficiency. The system was operated with a common power-jet supply pressure of 1 to 15 psig. The system was switched with flow at atmospheric pressure. The third-stage output was exhausted to atmosphere through a 12-deg diffuser. Flow gains up to 3000, pressure recovery of 50 to 67 percent, and power gains up to about 10,000 were obtained. (Author)

AD-417 892 Div. 9
OTS price $5.60

Space Sciences Lab. General Electric Co., Philadelphia, Pa.
NORMAL SHOCK WAVE CALCULATIONS IN AIR AT FLIGHT SPEEDS UP TO 25,000 FT./SEC.
by C. A. Cook, L. M. Gilbert and S. M. Scala.
Nov 62, 1v. Rept. no. R62SD76
Contract AF04 694 222
Unclassified report

Descriptors: (*Shock waves, Thermochemistry), (*Hypersonic flow, Stagnation point), High altitude, Gases, Thermodynamics, Pressure, Temperature, Plasma jets, Density, Hypersonic characteristics, Frozen equilibrium flow, Chemical reactions, Compressible flow, Enthalpy, Numerical analysis, Molecular properties, Atmosphere models.

New calculations of the equilibrium gas properties behind a normal shock wave are presented based on the 1959 ARDC Model Atmosphere. Graphs of pressure, density, and temperature are presented for conditions behind a normal shock wave and at the stagnation point following an isentropic compression, for high altitude hypersonic flight. The regime treated covers altitudes from 100,000 feet to 400,000 feet in increments of 2000 feet, and a range of flight speeds from 10,000 to 25,000 feet per second. (Author)

AD-418 010 Div. 9, 27
OTS price $5.60

Illinois Inst. of Tech., Chicago.
AN INVESTIGATION OF INDUCED SEPARATION OF SUPERSONIC CHANNEL FLOW.
Final technical rept.,
by Andrew A. Fejer and Jean-Pierre Josse.
June 63, 42p.
Contract AF33 616 8183, Proj. 7116, Task 7116 01
ARL 63 102 Unclassified report

Descriptors: (*Supersonic flow, Separation), (*Separation, Supersonic flow), (*Deflection, Gas flow), Thrust vector control systems, Rocket motors, Exhaust gases, Schlieren photography.

Experiments were conducted to determine the nature of the interaction between a supersonic main flow through a divergent passage and a secondary flow introduced into the passage through suitable openings in the passage wall. The magnitude of the side force generated by the interaction was determined, Schlieren observations were made of the field of flow and the effective deflection angle of the main flow was established. The influence of various parameters was investigated in the course of study: Mach Number of the main flow and secondary flow at the interaction; ratio of secondary to primary flow; location, size and shape of secondary flow orifices. (Author)

AD-418 055 Div. 9, 25, 15
OTS price $1.60

Redstone Scientific Information Center, Redstone Arsenal, Ala.
EXPERIMENTAL DETERMINATION OF THE PRESSURE OF SATURATED MERCURY VAPOR AT O DEGREES AND HIGHER TEMPERATURES,
by Martin Knudsen. 16 Sep 63, 11p.
RSIC 60 Unclassified report

Trans. from Annalen der Physik, Vol. 29, pp. 179-193, 1909. German text.

Descriptors: (*Mercury, Vapor pressure), (*Vapor pressure, Determination), Temperature, Gas flow, Integral equations, Pressure gages, Temperature control, Equations, Errors, Thermometers, Transition temperature, Vaporization, Specific heat.

AD-418 159 Div. 9, 25, 4
OTS price $8.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
CHEMICAL KINETICS IN A REENTRY FLOW FIELD,
by M. H. Bortner. Aug 63, 96p. Rept. no. R63SD63
Unclassified report

Descriptors: (*Reaction kinetics, Gas flow), (*Gas flow, Reentry vehicles), (*Kinetic theory, Gas flow), Shock waves, Reentry vehicles, Oxygen, Nitrogen, Sodium, Gas ionization, Dissociation, Recombination reactions, Impurities, Tables, Bibliography.

Contents:
Chemical Kinetics in a Reentry Flow Field
The Role of Chemical Kinetics
The Principles of Chemical Kinetics
Relaxation Processes
The Chemical System of the Flow Field
Reaction Rate Constants
Dissociation Reactions
Rearrangement Reactions
Associative Ionization
Collisional Ionization
Charge Exchange Reactions
Attachment
Other Ion reactions
Calculations
Impurities and Other Chemical Systems
The General Effect of Impurities
Sodium
Planetary Entry
Table of Suggested Rate Constants

AD-418 180 Div. 9, 25
OTS price $10.10

Columbia U., New York.
MAGNETOGASDYNAMIC BOUNDARY CONDITIONS AT A CONDUCTING WALL,
by Theodore Ernest Luzzi, Jr. 1963, 113p.
Rept. no. 2
Grant AF AFOSR48 63
AFOSR 5221 Unclassified report

Descriptors: (*Boundary layer, Plasma sheaths), (*Plasma physics, Fluid mechanics), (*Electrodes, Plasma physics), Gas flow, Continuum mechanics, Kinetic theory, Electric fields.

Velocity boundary conditions at a conducting wall have been developed for the continuum magnetogasdynamic equations. The wall is separated from the fully ionized plasma by a Langmuir type sheath. The effect of the sheath on the single fluid plasma boundary conditions are studied. The potential of the wall may be either greater than, or less than, that of the plasma. Boundary conditions have been developed for both cases. For the case where the wall potential is greater than the plasma it is possible to have a slip velocity at the wall where no-slip would occur in an equivalent unionized gas flow. (Author)

AD-418 294 Div. 9
OTS price $8.60

Technical U. of Berlin (Germany).
GROWTH OF VELOCITY FLUCTUATIONS LEADING TO TURBULENCE IN FREE SHEAR FLOW,
by Rudolf Wille. 30 June 63, 96p.
Contract AF61 052 412
AFOSR 5325 Unclassified report

Descriptors: (*Fluid flow, Shear stresses), (*Boundary layer transition, Velocity), Mathematical analysis, Turbulence, Equations, Laminar boundary layer, Stability, Nozzles, Jets, Frequency, Anemometers, Subsonic flow, Oscillation, Vortices.

A special case of transition from laminar to turbulent flow is discussed: namely, a laminar free boundary layer, as it occurs at free jets near the nozzle, passes through the stages of meandering, vortex formation, and decay of laminar vortex flow. Hydrodynamic stability theory has been applied to the boundary layers of axisymmetric and two-dimensional jets. For experimental data the hot-wire technique has been applied. In many details experiment and theory are in good agreement, e.g. the frequencies of amplified velocity fluctuations. The characteristic data of vortex flow have been experimentally investigated using a Karman vortex street as model flow. The existence of a critical vortex number could be verified for one special case. The influence of the jet velocity profile at the origin of the jet on the axial and radial distribution of the mean velocity and the turbulent fluctuations has been studied experimentally. An experimental arrangement for producing free Couette flow is described and a first experimental analysis of the highly instable Couette jet is given. (Author)

AD-418 303 Div. 9
OTS price $1.10

Johns Hopkins U., Baltimore, Md.
TURBULENT SHEAR FLOW,
by Stanley Corrsin. May 63, 7p.
Contract AF49 638 248
AFOSR 5323 Unclassified report

Descriptors: (*Turbulence), (*Jet mixing flow) (*Jets), (*Two dimensional flow, Measurement).

AD-418 354 Div. 9, 15
OTS price $5.60

Aerospace Information Div., Washington, D. C.
CONTRIBUTION TO THE APPROXIMATION THEORY OF COMPRESSIBLE TURBULENT BOUNDARY LAYERS. II. CALCULATION OF UNIVERSAL FUNCTIONS AND EXAMPLES,
26 Aug 63, 1v.
AID T63 110 Unclassified report

Descriptors: (*Turbulent boundary layer, Compressible flow), (*Laminar boundary layer, Numerical analysis), Compressible flow, Shear stresses, Heat transfer, Partial differential equations, Integral equations, Energy, Integration, Differential equation, Incompressible flow, Polynomials, Viscosity, Functions, Complex variables, Metal plates, Drag.

A critical examination of the utilizability of the infinite number of available integral conditions for the improvement of the approximation theory for laminar and turbulent boundary layers is made. It is shown that earlier physics concepts (26), (27), with respect to the application of empirical laws for shearing stress and dissipation of turbulent boundary layers on the compressible area, can also be generalized for the case of flow with heat transfer. Drag coefficients up to Mach 7, calculated for the flat plate on the basis of this generalization, agree well with available measurement results. Finally, several ideas for improving and simplifying the approximation theory are discussed. (Author)

AD-418 381 Div. 9, 25
OTS price $2.60

General Applied Science Labs., Inc., Westbury, N. Y.
EXPERIMENTAL SOUND FIELD DISTRIBUTIONS OF A JET WITH A STATIONARY ACOUSTIC SOURCE,
by S. Slutsky. May 63, 19p. Technical rept. no. 351
Contract AF49 638 194
AFOSR 5322 Unclassified report

Descriptors: (*Jet mixing flow, Ultrasonic properties), (*Sound, Axially symmetric flow), Jets, Intensity, Measurement, Signal-to-noise ratio, Theory, Experimental data, Nozzles, Simulation, Propagation.

Measurements are made in the far field of an axisymmetric jet using a non-convecting ultrasonic source located on the jet axis. Reasonable comparisons are found with the results of an analytical model based on parallel flow and boundaries. Experiments were then carried out on a water table in which a two-dimensional configuration was simulated under conditions of parallel steady jet flow, and of wavy jet flow. The results confirmed indications that the wavy flow in a jet is responsible for the diffusion of sound field directionality. (Author)

10. FUELS AND COMBUSTION

AD-418 275 Div. 10
OTS price $1.60

Research and Technology Div., Air Force Systems Command, Edwards, Calif.
GELLED PROPELLANT SAFETY INVESTIGATION,
by Jack G. McCroskey. July 63, 12p.
RTD TDR63 1069 Unclassified report

Descriptors: (*Thixotropic rocket propellants, Safety), (*Liquid rocket propellants, Safety),

(*Safety, Thixotropic rocket propellants), Liquid rocket oxidizers, Liquid rocket fuels, Nitrogen compounds, Tetroxides, Hydrazine derivatives, Gels, Hazards, Propellant tanks, Rupture, Test methods.

N2O4 and UDMH gelled propellant tankage rupture tests were conducted to determine safety and handling hazards aspects of gelled propellants. Intermixing of gelled N2O4 and UDMH results in the following: A large fire will occur if large surface areas of gelled fuel and oxidizer come in contact. It will be similar to one that occurs when the two hypergolic propellants are mixed in their liquid state. A small controllable fire will occur when relatively small surface areas of the gel come in contact. A spill of gelled propellant will remain confined in a much smaller area than that of an equivalent amount of liquid propellant. Increased safety is provided by gels when small leaks occur at fittings or welds since gels will not flow from the leak as liquid will. Gelling does not alter a liquid propellant with respect to toxicity, vapor pressure or reactivity and all safety procedures which apply to liquid propellants should be observed when handling gelled propellants. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

No Entries

12. GUIDED MISSILES

AD-417 852 Div. 12
OTS price $2.60

Boeing Co., Seattle, Wash.
WING II.
Monthly summary rept. no. 4, 1-31 July 63.
14 Aug 63, 31p.
Contract AF04 647 757
Unclassified report

Report on MINUTEMAN WS-133A.

Descriptors: (*Guided missiles (Surface to surface), Test vehicles), Guided missile personnel, Checkout procedures, Maintenance, Transportation, Storage, Ground support equipment, Guided missile components, Tables.

This is the test summary report concerning the Minuteman missile for the period 1 - 31 July 1963. It defines major test requirements, their degree of attainment, major program problems encountered and recommendations which may improve or accelerate the test program as defined in the Wing II VAFB Test Program Plan, BSD TR 63-29. It is not the purpose of this document to describe in detail each test performed, but rather, to report in general terms, the major test operations scheduled during the period, the major objectives attained during the period, and to describe briefly, the manner in which the program has progressed. (Author)

AD-417 858 Div. 12
OTS price $6.60

Boeing Co., Seattle, Wash.
WING II.
Final ground test rept.
24 July 63, 59p.
Contract AF04 647 757
Unclassified report

Report on MINUTEMAN WS-133A.

Descriptors: (*Guided missiles (Surface-to-surface), Ground support equipment), Guided missiles, Air transportation, Containers, Maintenance, Modification kits, Checkout procedures, Test methods, Test facilities, Personnel management, Guided missile personnel, Training.

This report was prepared to provide a history of the receipt-thru-launch processing of Flight Test Missile (FTM) 658 and the associated launch facility refurbishment. Test operations and related activities are described in detail with special emphasis placed upon identification of Weapon System deficiencies. (Author)

AD-417 928 Div. 12
OTS price $1.60

General Dynamics Electronics, San Diego, Calif.
WEAPON SYSTEM WS-107A-2. PROGRAM PROGRESS AND SECURITY REPORT, APPENDIX IV TO EXHIBIT A.
Aug 63, 13p.
Contract AF04 647 463
Unclassified report

Descriptors: (*Weapon systems, Communication system), Air Force, Guided missile (Surface-to-surface), Reports.

AD-418 121 Div. 12, 20, 25, 7
OTS price $5.60

Aerospace Corp., Los Angeles, Calif.
A GENERALIZED SHIELDING STUDY FOR NUCLEAR ELECTRIC SPACE POWERPLANTS,
by E. R. Berry. 26 Aug 63, 42p. Rept. no. TDR169 3560 20TN1
Contract AF04 695 169
SSD TDR63 217 Unclassified report

Descriptors: (*Satellites (Artificial), Nuclear power plants), (*Nuclear power plants, Reactor shielding materials), Manned spacecraft, Electromagnetic shielding, Tungsten, Gamma rays, Lithium compounds, Hydrides, Neutron absorbers, Reactor shielding calculations, Weight, Thickness, Optimization, Numerical analysis, Differential equations, Nuclear propulsion.

This report presents generalized shield weight and thickness curves suitable for providing rough estimates of the shield weights required for nuclear-reactor-powered electrical space powerplants, such as the SNAP series (Systems for Nuclear Auxiliary Power), over a wide range of conditions. The curves presented should also be applicable in many cases to nuclear rocket reactors operating in space. The shields considered are two-layer tungsten-lithium hydride shadow shields optimized to provide minimum shield weights. (Author)

AD-418 219 Div. 12, 13, 18, 26, 23
OTS price $3.60

Space Technology Labs., Inc., Los Angeles, Calif.
MINUTEMAN DATA BOOK DISTRIBUTION SECTION 10.0,

ISSUE NO. I FACILITIES, MARK II RE-ENTRY VEHICLE, (AVCO).
25 Sep 63, 1v. Rept. no. 6600 1 2105
Unclassified report

Descriptors: (*Guided missiles (Surface-to-surface), Reentry vehicles), (*Reentry vehicles, Ground support equipment), (*Guided missiles, Military facilities), Warehouses, Storage, Construction, Maintenance, Guided missile personnel, Training, Design, Electrical equipment, Traffic, Water supplies, Sanitary engineering.

AD-418 262 Div. 12, 2
OTS price $5.00

Fundamental Methods Associates, Inc., New York.
ACTIVE SHIELDING AGAINST METEOROIDS.
Report for Apr 62-May 63,
by Carl N. Klahr and Norman N. Stein. Aug 63, 387p.
Contract AF33 657 8531, Proj. 6146, Task 614602
ASD TDR63 537 Unclassified report

Descriptors: (*Spacecraft, Shielding), (*Satellites (Artificial), Shielding), (*Space flight, Hazards), (*Space environmental conditions, Particles), (*Meteors, Shielding) Manned spacecraft, Cratering, Spallation, Feasibility studies, Research program administration, Electrostatic fields, Electromagnetic fields, Vaporization, Countermeasures.

The feasibility of a number of active shielding concepts against meteoroids is investigated. The effects of meteoroid flux on space vehicles and their components are first assessed, and the requirements for passive (mass) shielding are calculated. It is found that some active shielding concepts are practicable in the near term while others would require at least a ten year development period. The most promising active shielding concept is the Dustwall, which can be developed in the near future. It is calculated that a dustwall system will weigh between 5% and 10% as much as passive shielding giving the same protection. In addition, it will protect components for which mass shielding cannot be used. (Author)

AD-418 277 Div. 12, 26
OTS price $5.60

Boeing Co., Seattle, Wash.
ACCEPTANCE SUMMARY REPORT FLIGHT TEST MISSILE 439, MODEL SPECIFICATION S-133-1007C,
by Carl J. Lish. 9 May 63, 1v. Document no. D2 10889 1, vol. 56
Contract AF04 647 289
Unclassified report

Descriptors: (*Guided missiles (Surface to surface), Quality control), (*Guided missile components, Acceptability), Procurement, Maintenance, Military requirements, Specifications, Visual inspection, Damage, Installation, Calibration, Tests, Test equipment, Tables.

This data identifies and describes the actual status of End Items, designated for First Article Customer Inspection or Team Acceptance review. It includes any Waivers or Deviations that exist or are required for Non-Conformance Items. Status reporting will be at the delivery level unless otherwise noted. Responsibility of maintenance to include Base Commitments is transferred to the Base Quality Control Planning Unit receiving the equipment. (Author)

AD-418 288 Div. 12
OTS price $4.60

Naval Weapons Lab., Dahlgren, Va.
TARTAR STRUCTURAL FIRING TEST ABOARD THE USS ALBANY (CG-10),
by J. W. Loving, T. I. Dodson, P. E. Wine and C. J. Mazzella. 4 Sep 63, 1v.
NWL Rept. no. 1880 Unclassified report

Descriptors: (*Guided missile launchers, Safety), (*Guided missile safety, Naval vessels (Combatant)), Shipborne, Guided missiles (Surface-to-air), Exhaust gases, Launching, Exhaust flames, Temperature, Toxicity, Blast, Sound, Ship structural components, Damage, Cruisers, Firing tests (Ordnance).

Fifteen TARTAR MARK 1 MOD 0 dual-thrust rocket motors with concrete slugs were fired aboard the USS ALBANY (CG-10) to investigate the adequacy of the protection for the TARTAR launching systems personnel against blast effects and to determine the effects of the booster exhaust on the ship's structures. During the test series, measurements of toxic gas leakage into personnel areas, sound pressure levels, structural strains and deflections and air temperatures were obtained. The results indicated no major structural deficiencies; however, gas leakage into personnel areas adjacent to the launchers, damage to the RBFC units of the TARTAR launchers and minor damage to equipment in the blast areas were observed. (Author)

AD-418 329 Div. 12
OTS price $1.10

Aeronutronic, Newport Beach, Calif.
PENETRATION AIDS DEVELOPMENT.
Reliability summary rept. for Aug 63.
31 Aug 63, 5p.
Contract AF04 694 23
Unclassified report

Descriptors: (*Penetration, Antimissile defense system), (*Reliability, Penetration), Radar decoys, Failure (Mechanics), Guided missile components.

13. INSTALLATIONS AND CONSTRUCTION

AD-417 905 Div. 13
OTS price $1.10

Fenwal, Inc., Ashland, Mass.
EVALUATION OF LIGHTWEIGHT FIRE EXTINGUISHING SYSTEM UNDER SIMULATED FLIGHT CONDITIONS.
Interim rept. no. 1, 1 Apr-2 June 63,
by C. J. Cole. 7 June 63, 4p.
Contract N600 19 59752
Unclassified report

Descriptors: (*Fire extinguishers, Airborne), Instrumentation, Effectiveness, Simulation, Acceptability.

A thorough review of the contract requirements has been made and a detailed schedule of objectives has been prepared to fulfill those requirements. Materials are being procured. Specifications for the Test Apparatus have been prepared. A manufacturer has been selected to build the Test Apparatus and is preparing drawings for final approval. (Author)

Division 13 - INSTALLATIONS AND CONSTRUCTION

AD-418 028 Div. 13, 31, 2
OTS price $4.60

Little, Arthur D., Inc., Cambridge, Mass.
STRESS ANALYSIS OF SHIP-SUSPENDED HEAVILY LOADED CABLES FOR DEEP UNDERWATER EMPLACEMENTS.
Aug 63, 44p. Rept. no. 1370863
Contract NObsr81564, Proj. S7001 0307
Unclassified report

Technical report on Project Trident.

Descriptors: (*Cables (Mechanical), Ocean currents), (*Stresses, Cables (Mechanical)), Friction, Suspension devices, Mathematical analysis, Underwater equipment, Weight, Water waves, Motion, Deformation, Drag, Frequency.

This report discusses the operational aspect of lowering heavy array structures to the bottom of the deep oceans. The study is limited to the case of a single cable lowering the array vertically. Drag of the cable and array, the effect of currents, and cable material are considered. Results of the study are presented in plot form involving a nondimensional maximum (dynamic) stress versus a nondimensional frequency for various mass and drag parameters. Examples of applications are also included. (Author)

AD-418 070 Div. 13
OTS price $21.00

Little, Arthur D., Inc., Cambridge, Mass.
CONTAMINANT FREEZE-OUT IN HEAT EXCHANGERS.
VOLUME III - CONTAMINANT FREEZE-OUT TEST DATA.
Final rept., Apr 62-June 63,
by R. B. Hinckley, J. C. Burke, F. E. Ruccia, R. P. Berthiaume and R. C. Reid. July 63, 1v.
Contract AF33 657 8695, Proj. 3084, Task 308404
ASD TDR63 508, Vol. 3 Unclassified report

Descriptors: (*Heat exchangers, Freezing), Separation, Water, Carbon dioxide, Pressure, Temperature, Coolants, Air, Heat transfer.

As part of an analytical and experimental study of water and carbon dioxide freeze-out in heat exchangers, a test program was conducted covering a wide range of air stream pressures, temperatures, mass flow and concentration conditions. The test program consisted of 42 tests, grouped by objective, into five test series. The test data includes mass flow rates, heat balances, contaminant concentrations at the heat exchanger inlet and outlet, notes on the deposit appearance, and tabulations of heat exchanger pressures and temperatures as functions of time and position for each test. Brief summaries of the data obtained in each test series are included. The overall objectives of this test work and the analyses of the results are presented in Volume II to the basic report. (Author)

AD-418 096 Div. 13
OTS price $2.60

Cornell Aeronautical Lab. Inc., Buffalo, N. Y.
A STUDY OF INJURIES RELATED TO PADDING ON INSTRUMENT PANELS,
by B. J. Campbell. 1 Aug 63, 25p. Rept. no. VJ1823 R2
Grant AC00101 01
Unclassified report

Descriptors: (*Accidents, Vehicles), (*Vehicles, Accidents), Wounds and injuries, Heat, Instrument panels, Analysis, Effectiveness, Children.

AD-418 144 Div. 13, 9, 25
OTS price $21.00

Little, Arthur D., Inc., Cambridge, Mass.
CONTAMINANT FREEZE-OUT IN HEAT EXCHANGERS.
VOLUME II - BASIC INVESTIGATION OF CONTAMINANT FREEZE-OUT.
Final rept., Apr 62-June 63,
by R. B. Hinckley, J. C. Burke, F. E. Ruccia, R. P. Berthiaume, and R. C. Reid. July 63, 55p.
Contract AF33 657 8695, Proj. 3084, Task 308404
ASD TDR63 508, Vol. 2 Unclassified report

Descriptors: (*Contamination, Freezing), (*Heat exchangers, Contamination), Water, Carbon dioxide, Analysis, Fluid flow, Performance tests, Pressure, Temperature, Measurement, Photographic analysis, Cryogenics.

An analytical and experimental study was conducted to investigate the principal mechanisms of water and carbon dioxide freeze-out and to develop a method for predicting the effects of contaminant freeze-out on heat exchanger performance. This program included an analytical study of the various mechanisms by which contaminant freeze-out may occur. A test facility was constructed having the capability of simulating a wide range of air stream pressures, temperatures, mass flow, and concentration conditions. A glass-walled test heat transfer section allowed visual and photographic observations of the frost formation as well as measurements of its effects on heat transfer and pressure drop. Based on the analytical and experimental results, the importance of the various mechanisms of contaminant freeze-out has been evaluated and a method generated for predicting the effect of contaminant freeze-out on heat exchanger performance. (Author)

AD-418 210 Div. 13
OTS price $3.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
FREEZING OUT MOISTURE AND CARBON DIOXIDE IN TUBULAR HEAT EXCHANGERS,
by G. V. Vasyunina and L. S. Aksel'rod.
26 July 63, 36p.
FTD TT63 320 Unclassified report

Report on Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Kislorodnogo Mashinostroyeniya, Apparaty i Mashiny Kislorodnykh Ustanovok, No. 4, pp. 184-207, 1961.

Descriptors: (*Heat exchangers, Freezing), Separation, Moisture, Carbon dioxide, Heat transfer, Pipes.

One of the methods of removing moisture and carbon dioxide from technological air flows is the freezing of these impurities in reversing heat exchanger-freezers serving simultaneously for cooling the air and heating the products of separation. When designing freezers their thermal regime, design, and dimensions should be determined which guarantee the prescribed content of the frozen component at the outlet from the device for the prescribed duration of its operation up to clogging or switching. In the past, research on freezing has been conducted under various conditions which led, in most cases, to contradictory results and did not yield sufficient grounds for a true solution of the industrial problem. The results of an experimental investigation of certain fundamental questions connected with the operation of moisture and carbon dioxide freezers in air separators is reported. (Author)

AD-418 302 Div. 13
OTS price $6.60

Florida U., Engineering and Industrial Experiment Station, Gainesville.
RESPONSE OF ELASTIC STRUCTURE TO RANDOM EXCITATIONS OF VARIOUS CORRELATIONS,
by Marc R. P. Trubert. Aug 63, 60p.
Grant AF AFOSR62 313, Proj. 9782, Task 37718
AFOSR 5319 Unclassified report

Descriptors: (*Cantilever beams, Loading (Mechanics)), (*Elastic shells, Load distribution), Experimental data, Mathematical models, Correlation techniques, Ststistical distributions, Measurement, Models (Simulations), Statistical processes.

It is shown that it is possible to determine the response of a linear continuous structure (cantilever beam) to random loadings of various correlations by a semiexperimental method. The mathematical aspect of the problem is stated. The spatial transfer function representing the dynamic characteristics of the structure is determined experimentally by a cross-correlation technique. The response to various correlated loadings is computed and a comparison is made with the response determined experimentally. The effect of the correlation is noted. (Author)

14. MATERIALS (NON-METALLIC)

AD-417 882 Div. 14, 8, 20
OTS price $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
PERFORMANCE OF LUBRICANTS AND THERMAL CONTROL MATERIALS UNDER SIMULATED SPACE CONDITIONS,
by R. E. Mauri. 3 June 63, 22p.
AEC NP12906 Unclassified report

Descriptors: (*Lubricants, Space environments condition), (*Space environmental condition, Lubricants), (*Materials, Space environmental), Oils, Greases, Films, Plastics, Metals, Bearings, Simulation, Ultraviolet radiation, Nuclear radiation, Meteorites, Ceramic materials, Adhesives, Elastomers, Electronic equipment, Vacuum apparatus, Propellants, Storage, Liquid rocket propellants.

The gross effects of space environment on typical materials for spacecraft applications are briefly discussed. Equipment and experimental procedures used at LMSC for testing ans selecting materials in support of a typical high-reliability satellite hardware program are described. Principal material problem areas associated with this program are lubricants for mechanisms and thermal control materials. Experimental details and results on the effect of high vacuum and operating conditions on oils, greases, and dry-film lubricants for bearings are presented. Also discussed are applications of thermal control materials and results of environmental testing of solar reflectors such as white paints in the presence of intense ultraviolet radiation in vacuum. (Author)

AD-417 907 Div. 14, 17
OTS price $3.60

Snell, Foster D., Inc., New York.
DEVELOPMENT OF ULTRA-THIN FILM PRESERVATIVE COMPOUNDS.
Quarterly rept. no. 3, 1 May-31 July 63,
by William Miglas and Bernard Berkeley. 27 Aug 63, 27p.
Contract NOw63 0293
Unclassified report

Descriptors: (*Films, Corrosion inhibition), (*Corrosion inhibition, Films), (*Plastic coatings, Corrosion inhibition), Epoxy plastics, Acrylic resins, Polymers, Adhesion, Steel, Aging (Materials), Humidity cabinets, Tests, Metalorganic compounds, Titanium compounds, Dioxides.

Films, when applied from solutions which have aged for several weeks, appear to afford better corrosion protection to metals (based on results from testing in the controlled cyclic condensation humidity cabinet) than do films applied from more freshly prepared solutions. Half-Second Butyrate films modified with a dehydrated castor alkyd have better adhesion to metal surfaces than do unmodified films, but inclusion of nonyl phenoxy acetic acid in the formulations again results in poor adhesion. No success was achieved in efforts to improve the adhesion of Acryloid B-72 films thus far. Falex wear test data fail to indicate any pattern of lubricative differences of various films which might be related to formulation variations. (Author)

AD-417 927 Div. 14, 31
OTS price $1.10

Naval Applied Science Lab., Brooklyn, N. Y.
INSPECTION OF NEOPRENE COATINGS APPLIED TO HYDROFOIL ASSEMBLIES OF HYDROFOIL CRAFT HIGH POINT (PC(H)-1).
18 Sep 63, 9p.
Proj. SF013 13 01; Lab. Proj. 9300.17, Task 0906
NASL Technical memo. no. 1
Unclassified report

Descriptors: (*Rubber coatings, Hydrofoil boats), (*Hydrofoil boats, Rubber coatings), Hydrofoils, Cavitation, Erosion, Adhesion, Coatings, Steel, Antifouling coatings.

This report describes the condition of the cavitation - erosion resistant neoprene coating, Laboratory formulation ML-C570, after preliminary and builders trials of the PC(H)-1 during May 1963. This coating had been applied to the foils, struts, rudders and flaps of the PC(H)-1. The neoprene coating applied to the epoxy smoother material used in isolated areas of the coated structures, showed very high adhesive strength, exceeding the adhesive strength to bare steel. (Author)

AD-418 005 Div. 14, 26
OTS price $2.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
EFFECT OF A MOLDED PATTERN ON THE RIGIDITY OF PLASTICS,
by Solomon Goldfein. 29 May 63, 18p.
Task 1D024401A11402
AERDL Technical rept. no. 1748TR
Unclassified report

Descriptors: (*Plastics, Hardening), (*Molding, Plastics), (*Laminated plastics, Hardening), (*Thermoplastics, Hardening), Processing, Effectiveness, Hardness, Manufacturing methods, Material forming, Vacuum apparatus, Materials.

This report covers an investigation of the effect of a molded pattern on the rigidity of plastic materials. It is concluded that: (1) Thermoplastic sheet material and glass-reinforced plastic laminates both showed increases in stiffness similar to those reported for such metals as steel, Al and Co; (2) Assuming a rigidity of 1 for a flat sheet, a single formed sheet had a rigidity of 6; two molded sheets bonded, a rigidity of 25; and two molded sheets

face-to-face with pattern matched and bonded, 44; (3) Although the rigidity varied with the angle of test, none of the deflections varied by more than 26% from the average; (4) Rigidized sheet material may be made without increasing the weight of the material; and (5) Use of the rigidizing pattern could be made to overcome the initial low modulus of elasticity of the plastic. (Author)

AD-418 030 Div. 14
OTS price $16.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
STRUCTURES WITH FOAM PLASTIC FILLERS. (Konstruktsii s Zapolnitelyami iz Penoplastov),
by A. Ya. Alexandrov, M. Ya. Borodin and V. V. Pavlov. 10 June 63, 244p.
FTD TT63 61 Unclassified report

Trans. from Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Oborongiz, pp. 1-187, 1962.

Descriptors: (*Foams, Plastics), (*Plastics, Structures), Expanded plastics, Production, Pressure, Air, Polyvinyl chloride, Styrene plastics, Isocyanate plastics, Silicone plastics, Epoxy plastics, Dielectric properties, Stability, Liquids, Solvents, Sheets, Mechanical properties, Tests, Physical properties.

AD-418 119 Div. 14, 32
OTS price $1.60

Plastics Lab., Princeton U., N. J.
INDEX OF TECHNICAL REPORTS AND PUBLICATIONS.
31 July 63, 10p.
Unclassified report

Descriptors: (*Bibliographies, Plastics), (*Indexes, Plastics), Polymers, Reports.

AD-418 214 Div. 14
OTS price $1.60

Naval Applied Science Lab., Brooklyn, N. Y.
INVESTIGATION OF EFFECT OF MATERIAL VARIABLES ON SHEAR PROPERTIES OF ORTHOGONAL FILAMENT WOUND MATERIALS. REINFORCED PLASTICS FOR DEEP SUBMERGENCE AND OTHER HIGH STRENGTH APPLICATIONS.
30 Sep 63, 11p.
Lab. Proj. 6189, Task 1008
NASL Technical memo. no. 2
Unclassified report

Descriptors: (*Laminated plastics, Shear stresses), (*Plastics, Reinforcing materials), (*Filament wound construction, Mechanical properties), Pressure vessels, Glass textiles.

The influence of a number of material variables on the interlaminar shear strength of orthogonal filament wound materials has been investigated. Included in these studies were different types of reinforcement, reinforcement finishes, methods of winding (wet and prepreg), and fiber dispersions. It was determined that in all cases in which solid filament constituted the reinforcement, mode of failure was by shear at an interface between layers of crossed fibers rather than within a 'circ' or 'long' layer. In the case of a hollow fiber laminate, failure occurred both at a crossed fiber interface and within a layer of cross fibers, at lower shear values than solid filament materials. (Author)

AD-418 221 Div. 14, 22
OTS price $1.60

Ammunition Engineering Directorate, Picatinny Arsenal, Dover, N. J.
INVESTIGATION OF ALUMINUM FOIL PRESSURE-SENSITIVE TAPES FOR SEALING AMMUNITION ITEMS,
by Harvey T. Young and Donald E. Devine. Aug 63, 18p.
PA Technical rept. 3088
Unclassified report

Descriptors: (*Foils, Aluminum), (*Adhesive tapes, Foils), (*Ammunition, Seals (Stoppers)), Adhesives, Thickness, Environmental tests, Compatibility, Specifications, Military requirements, Humidity, Pressure, Explosive materials, RDX, PETN, Tests.

Four aluminum foil tapes were evaluated for an environmental seal on ammunition items. Three tapes met all of the requirements for sealing under 3 psi internal air pressure and satisfactory adhesion after environmental conditioning in accordance with MIL-STD-354 and 355. All the tapes were compatible with tetryl, cyclotol, RDX, Composition B and PETN. Pressure exerted upon application of the tape was found to be a critical factor. It was concluded that a revised MIL-T-11291 Specification (Tape, Adhesive, Aluminum-Backed (For Use With Ammunition), 24 July 1951) could be used for procurement of the tapes.

AD-418 260 Div. 14
OTS price $1.75

IIT Research Inst., Chicago, Ill.
RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS VOLUME XV - ALUMINA-CONDENSED FURFURYL ALCOHOL RESINS.
Rept. for Nov 60-Nov 62,
by C. W. Boquist, E. R. Nielsen, H. J. O'Neil and R. E. Putcher. July 63, 61p.
Contract AF33 616 6915, Projs. 7350 7381 and 7 817, Tasks 735002 and 738102
WADD TR61 72, Vol. 15 Uncalssified report

Descriptors: (*Graphite, Binders), (*Binders, Graphite), (*Thermosetting plastics, Graphite), Polymers, Preparation, Pyralysis, Condensation reactions, Viscosity, Elasticity, Aluminum compounds, Oxides, Catalysts, Spectra (Infrared), Composite materials, Alcohols, Decomposition.

Because alumina-condensed furfuryl alcohol resins offer several advantages over analogous acid-condensed resins, the work described in this report has been directed toward gaining a more complete understanding of their physical and chemical properties, both prior to and during thermosetting and pyrolysis. The work also includes a study of the interactions of the resin when used as a binder with certain filler materials. Equipment and methods used in preparing resins of different viscosities are briefly discussed. Data obtained from fractional distillation, gas chromatography, differential thermal analysis, thermogravimetric analysis, X-ray studies, shrinkage measurements, and dynamic elastic modulus measurements are presented, interpreted and correlated. Also included is information on the use of low viscosity resin as an impregnant, resin modifications, cured resin yield, and microstructures. (Author)

AD-418 395 Div. 14, 4
OTS price $1.60

Olin Mathieson Chemical Corp., New Haven, Conn.
B10H12 POLYMERS.
Interim rept. no. 2,
by T. L. Heying, H. A. Schroeder, T. A. Knowles, J. R. Reiner, and O. G. Schaffling. 15 Apr 63, 10p. Technical rept. no. 13

Contract Nonr339500, Proj. NR356 431
Unclassified report

Descriptors: (*Decaboranes, Polymers), (*Organic compounds, Heat resistant plastics), (*Phosphorus compounds, Heat resistant plastics), (*Heat resistant plastics, Decaboranes), Composite materials, Polymers, Organic phosphorus compounds, Organic nitrogen compounds, Polymerization, Synthesis (Chemistry), Molecular weight, Stability, Laminated plastics, Glass textiles, Asbestos, High-temperature research, Spectra (Infrared).

15. MATHEMATICS

AD-417 883 Div. 15, 1
OTS price $5.60

Army Missile Test and Evaluation Directorate, White Sands Missile Range, N. Mex.
PRELIMINARY STUDIES OF ADVANCED MATHEMATICAL MODELING AND COMPUTING METHODS FOR FLIGHT SYSTEMS,
by James S. Pappas. Aug 63, 51p.
AMTED Technical note no. 29
Unclassified report

Descriptors: (*Flight control systems, Mathematical models), (*Transformations (Mathematics), Topology), Aerospace craft, Flight simulators, Matrix algebra, Control, Guidance, Computers, Programming (Computers), Equations, Stochastic processes, Functional analysis, Vector analysis, Simultaneous equations, Differential equations, Partial differential equations, Tensor analysis, Combinatorial analysis, Euler's angle.

The essence of sophisticated aero-space flight systems is multitudes of transformations referenced to moving bases. The matrix of a linear transformation on a vector space looks differently in different bases. ''Matrix'' methods applied to the classical dyadic yield the optimal representation of the linear transformation both from the standpoint of the design engineer and the machine. This paper presents systematic methods which are extremely flexible for arbitrary mapping the dynamical system equations back and forth from the vector-dyadic representations to ''transfer-matrix'' representations for computer mechanization. For clarity the transformations are restricted to ortho-normal bases. Current analog and digital computers do not efficiently utilize the capabilities of the machines. Preliminary matrix computer design considerations are presented and developed around transfer matrix block diagrams. (Author)

AD-418 066 Div. 15
OTS price $1.60

Syracuse U., N. Y.
PROBABILISTIC CIRCUIT THEORY - ON THE GENERATION OF POSITIVE REAL FUNCTIONS,
by F. M. Reza. Aug 63, 6p.
Contract AF30 602 2867, Proj. 8505
RADC TDR63 328 Unclassified report

Descriptors: (*Functions, Linear systems), (*Circuits, Theory), Complex numbers, Transformations (Mathematics), Equations, Polynomials, Networks, Synthesis, Complex variables.

A method is presented for generating positive real functions. The results are principally derived from the properties of unimodular functions of the right-half of the frequency plane. The suggested method embraces a variety of interesting theorems pertinent to electrical linear circuits. (Author)

AD-418 102 Div. 15
OTS price $10.10

Hebrew U. (Israel).
THE THEORY OF TRANSFINITE EFFECTIVITY,
by Azriel Levy. July 63, 123p. Technical rept. no. 12
Contract N62558 3510
Unclassified report

Descriptors: (*Mathematical logic, Functions), (*Metamathematics, Theory), Numbers, Sequences, Computers, Magnetic tapes, Configuration, Number theory, Control sequences, Mathematical models, Equations, Inequalities.

This report gives a new approach to the notion of recursive functionals which will consist of an imitation of the notion of Turing computability. It also unifies this and other approaches by proving their equivalence. (Author)

AD-418 160 Div. 15
OTS price $7.60

Coordinated Science Lab., U. of Illinois, Urbana.
ON THE SYNTHESIS OF OPTIMUM MULTIVARIABLE SYSTEMS,
by Ramakrishna Narayanasamy. July 63, 69p.
Rept. no. R173
Contract DA36 039AMC02208E, DA Proj. 3A 99 25 004
Unclassified report

Descriptors: (*Operations research, Mathematical models), (*Control systems, Synthesis), Matrix algebra, Feedback, Inequalities, Errors, Stability, Series, Integral transforms, Equation, Functions, Integral equations, Vector analysis, Linear systems, Statistical analysis.

A system with a feedback configuration is considered and this system is represented by an equivalent cascade system. Two independent transfer matrices represented in the cascade system are first synthesized. The transfer matrices in the feedback configuration are then solved from the transfer matrices in the cascade system. There is chosen one of the transfer matrices in the cascade system to minimize the effect of certain disturbances in the system outputs and system sensitivity with respect to plant parameter variations. Also, system stability and physical realizability of the controllers in the feedback configuration are considered in the choice of this transfer matrix. The other transfer matrix will be chosen to minimize a performance index with a constraint. The performance index to be minimized is the sum of the weighted M.S.E. and I.S.E respectively for systems with random and deterministic signals. The constraints to be satisfied are the sum of the mean-squared and integral-squared value of some function of plant inputs respectively for systems with random and deterministic signals. (Author)

AD-418 163 Div. 15, 8, 30
OTS price $5.60

Coordinated Science Lab., U. of Illinois, Urbana.
AN ALGORITHM FOR THE SYNTHESIS OF LARGE SEQUENTIAL SWITCHING CIRCUITS,
by John Elsey. May 63, 49p. Rept. no. R169
Contract DA36 039AMC02208, DA Proj. 3A99 25 004
Unclassified report

Descriptors: (*Switching circuits, Synthesis), (*Numerical methods and procedures, Synthesis), Digital computer, Programming (Computers), Functions, Computer storage devices, Mathematical models, Feedback, Sequence switches,

Control sequences, Coding, Synchronization, Matrix algebra, Equations, Computer logic, Combinatorial analysis, Tables.

With the development and widespread use of large digital computers, which are switching circuits, there has been an increasing interest in switching circuit theory. Much effort has been spent in designing or synthesizing switching circuits, but unfortunately many of the procedures now in use are more of an art than a science in that much insight and experience are usually required on the part of the designer. Some systematic design methods have been introduced but these are only applicable to rather small circuits. This thesis develops and presents an algorithm for synthesizing asynchronous sequential switching circuits. The algorithm has certain properties which make it useful and applicable to large switching circuits such as the control unit of a digital computer. The steps in the algorithm are systematic and simple permitting a solution to be obtained in a relatively short amount of time. The resulting design is not optimum in that the circuit has the minimum number of states or minimum amount of logic. (Author)

AD-418 193 Div. 15
OTS price $11.50

Institute of Science and Tech., U. of Michigan, Ann Arbor.
THE ANALYSIS OF A CERTAIN CLASS OF NONLINEAR SYSTEMS,
by A. Y. Bilal. Sep 63, 153p. Rept. no. 2900 392T
Contract DA36 039sc78801; Grant GP524
Unclassified report

Report of Project MICHIGAN.

Descriptors: (*Nonlinear systems, Analysis), (*Synthesis, Nonlinear systems), Numerical analysis, Control, Nonlinear differential equations, Functions, Operators (Mathematics), Functional analysis, Sequences, Integral equations, Series, Taylor's series, Equations, Theory, Inequalities, Matrix algebra, Linear systems, Circuits, Feedback, Programming (Computers), Digital computers, Errors, Tables, Integration.

In nonlinear analysis, the partitioning technique has been used to analyze a certain class of nonlinear systems whose dynamic behavior can be represented by a nonlinear differential equation with time-varying parameters. When suitable restrictions were placed on the linear, nonlinear, and forcing function terms, the system equation presented a unique solution which existed to the right of the initial state. The system solution was given as a limit of a sequence of Picard iterates X sub n which are well defined in a given domain and which belong to L sub 2 space. A formula was developed which permits determining the number of iterates necessary for the approximation of the solution in the mean square sense. Within the restrictions imposed on the system, the system response was found to be uniformly continuous with respect to the initial conditions and the system parameters. Two different definitions of the norms were selected, and the behavior of the system trajectory was investigated for two important cases: (1) at any instant of time and (2) on the average during an interval of interest. (Author)

AD-418 380 Div. 15
OTS price $1.10

Boeing Scientific Research Labs., Seattle, Wash.
SOLUTION OF THE INITIAL VALUE PROBLEM FOR THE RICCATI EQUATION,
by W. C. Hoffman. Aug 63, 7p. Mathematical note no. 315; D1 82 0285
Unclassified report

Also available from the author.

Descriptors: (*Partial differential equations, Mathematical analysis), Differential equations, Transformations (Mathematics), Linear systems, Matrix calculus, Integral equations, Polynomials, Series.

AD-418 385 Div. 15, 30
OTS price $12.00

Boeing Scientific Research Labs., Seattle, Wash.
VARIOUS METHODS AND COMPUTER ROUTINES FOR APPROXIMATION, CURVE FITTING, AND INTERPOLATION,
by J. F. Price and R. H. Simonsen. July 63, 157p. Mathematical note no. 249; D1 82 0151
Unclassified report

Also available from the author.

Descriptors: (*Curve fitting, Numerical analysis), (*Numerical methods and procedures, Programming (Computers)), (*Programming (Computers), Numerical methods and procedures), Programming languages, Polynomials, Functions, Equations, Least squares method, Digital computers, Control sequences, Data storage systems, Partial differential equations, Transformations (Mathematics), Matrix algebra, Coding.

16. MEDICAL SCIENCES

AD-417 837 Div. 16
OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE PROTECTIVE EFFECT OF DEEP BODY HYPOTHERMIA ON X-RAY INDUCED MITOTIC ABERRATIONS OF REGENERATING RAT LIVER,
by M. J. Ashwood-Smith and G. F. Leong. 7 Aug 63, 19p.
NRDL TR666 Unclassified report

Descriptors: (*Radiation effects, Reduction), (*Hypothermia, Radiation effects), (*Mitosis, X-ray), Radiation injuries, Tissues (Biology), Growth, Weight, Hypoxia, Rats, Laboratory animals, Liver.

The protective effect of hypothermia against X-ray induced mitotic aberrations of regenerating rat liver was studied. The mitotic index of control and irradiated animals was but little affected by the hypothermic treatment, whereas the effect of X-rays on retarding growth (body weight) was reduced considerably by hypothermia. Furthermore, the number of X-ray induced mitotic aberrations in regenerating rat liver of hypothermic irradiated rats was reduced to the control values. It was concluded that this latter effect was probable due to the extreme anoxic state rather than the concomitant hypothermia. (Author)

AD-417 894 Div. 16
OTS price $1.10

Naval Radiological Defense Lab., San Francisco, Calif.
ADULT THYMUS: LIMITED ROLE IN RECOVERY OF

HOMOGRAFT RESPONSE IN IRRADIATED MICE,
by M. L. Tyan, L. J. Cole, and W. E. Davis.
24 July 63, 8p.
NRDL Rept. no. TR661
Unclassified report

Descriptors: (*Radiation effects, Laboratory animals), (*Transplantation, Radiation effects), Tissues (Biology), Endocrine glands, Recovery, Survival, Skin, Lethal dosage, Bone marrow, Immunology.

Thymectomized and sham-thymectomized adult LAF1 and CBA mice received lethal irradiation and were protected with syngeneic bone marrow. Thirty days after irradiation the survivors were grafted with allogeneic and xenogeneic (rat) skin. The thymectomized mice rejected their rat grafts only slightly later than did the mice in the sham-thymectomy group; in contrast, allogenic grafts survived significantly longer on the thymectomized mice than they did on the mice in the control group. (Author)

AD-417 993 Div. 16
OTS price $1.60

Miami U., Coral Cables, Fla. School of Medicine.
MOUSE CARCINOGENICITY STUDY.
Final rept., 1 Mar 57-30 May 63,
by William B. Deichmann. 30 May 63, 14p.
Contract DA49 007md789
Unclassified report

Descriptors: (*Neoplasms, Mice), (*Food, Radiation damage), Pathology, Tissues (Biology), Histology, Fishes, Potatoes, Beef, Vegetables, Fruits, Corn, Diet, Nutrition, Animals, Survival, Laboratory animals.

AD-418 224 Div. 16
OTS price $1.60

Armed Forces Pest Control Board, Washington, D.C.
MILITARY PREVENTIVE MEDICINE. ECOLOGY AND CONTROL OF DISEASE VECTORS AND RESERVOIRS.
Annual rept. no. 6 for 1963,
by Harold D. Newson, W. B. Hull and Richard T. Holway. 15 Aug 63, 11p.
Proj. 3A025601A806
Unclassified report

Descriptors: (*Pest control, Armed forces (United States)), (*Insects, Information retrieval), Reports.

During its sixth year the Armed Forces Pest Control Board has continued to emphasize the development of uniform policies and procedures in pest control matters and the application of joint efforts in research and operational projects in which all three services have a major interest. There has been a considerable expansion of coordination with other Federal agencies and of information activities. The establishment of the Military Entomology Information Service is particularly noteworthy. These activities have been made possible by the full support of the Department of Defense, the members of the Board, and the agencies they represent. (Author)

AD-418 252 Div. 16
OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
RAPID, ACCURATE ANALYSIS OF BLOOD LACTATE,
by James P. Ellis Jr., Stephen M. Cain and Edgar W. Williams. June 63, 8p.
Task 775801
SAM TDR63 49 Unclassified report

Descriptors: (*Blood, Chemistry), (*Acids, Blood), Lactose, Enzymes, Organic compounds, Analysis, Blood chemistry.

A method is described for the enzymatic analysis of blood L-lactic acid. The method is based on existing methods, but incorporates certain unique features which permit a rapid and precise analysis of a large number of samples. One of the more important features is the use of a simplified procedure for correcting the problematic drift of the unstable reaction mixture. In addition, conditions for the enzymatic activity were established which facilitate complete oxidation of lactate in 30 to 35 minutes. A comparative analysis of several blood filtrates, using the present method versus a well-known chemical method, as well as recovery analyses using the two methods, establishes the validity of the present test system. (Author)

AD-418 268 Div. 16
OTS price $1.10

Illinois U. Coll. of Medicine, Chicago.
GASEOUS TISSUE NITROGEN OF RATS EXPOSED TO SIMULATED ALTITUDE AND HIGH CONCENTRATIONS OF NITROGEN,
by S. F. Marotta, J. P. Marbarger and E. F. Robbins. May 63, 5p.
Contract AF41 657 332, Proj. 7758, Task 59613
SAM TDR62 113 Unclassified report

Descriptors: (*Nitrogen, Tissues (Biology)), (*Tissues (Biology), Nitrogen), (*High altitude, Nitrogen), Rats, Air, Respiration, Oxygen, Liver, Muscles, Sex glands, Spleen, Mixtures, Laboratory animals.

One hundred and fifty albino male rats were subjected to 12,000 feet simulated altitude while breathing ambient air (group II) or 100% oxygen (group III) for one-half, two, and four hours. When compared with control animals (group I) gaseous nitrogen was eliminated more rapidly in group III than in group II. The clearance of nitrogen from liver, skeletal muscle, and testis was more rapid, however, when animals were denitrogenated with 100% oxygen at ground level than at altitude. The reverse was observed for splenic nitrogen. Muscular and splenic gaseous nitrogen increased when animals were subjected to 10% oxygen in nitrogen (group IV). These observations suggest that local as well as total circulatory alterations accompanying either decompression, the breathing of gas mixtures, or both, may affect the rate of denitrogenation. (Author)

AD-418 284 Div. 16
OTS price $2.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
DEVELOPMENT OF TISSUE HYPOXIA DURING PROGRESSIVE HYPERTHERMIA,
by H. Meyer Frankel, James P. Ellis, Jr. and Stephen M. Cain. July 63, 18p.
Contract AF41 609 1499, Task 775801
SAM TDR63 34 Unclassified report

Descriptors: (*Hypoxia, Tissues (Biology)), Fevers, Blood, Heart, pH, Blood pressure, Blood vessels, Respiration, Temperature, Physiology, Hemoglobin, Acids.

Heart rate, mean arterial pressure, respiratory rate, minute volume, arterial blood PO2, PCO2, pH, hemoglobin saturation, lactic acid, and pyruvic acid were determined on anesthetized dogs during progressive hyperthermia. Heart rate increased as rectal temperature (Tr) increased. Mean arterial pressure began to decline

at Tr between 41 and 42 C. Respiratory rate and minute volume reached maximum values at temperatures around 42 C. Arterial PO2 and hemoglobin saturation did not decrease until rectal temperature exceeded 42 C. PCO2 decreased and pH increased from control values as minute volume increased. Arterial excess lactate showed the most marked rise at Tr's between 41 and 42 C. The conclusion was made that failure of external respiration is not the primary physiologic failure during progressive hyperthermia but the development of tissue hypoxia may be. (Author)

AD-418 286 Div. 16
OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
OBSERVATION OF THE ELEVATOR ILLUSION DURING SUBGRAVITY PRECEDED BY NEGATIVE ACCELERATIONS, by James A. Roman, Bruce H. Warren and Ashton Graybiel. Feb 63, 8p.
Task 793002
SAM TDR62 141 Unclassified report

Descriptors: (*Illusions, Weightlessness), (*Weightlessness, Illusions), Vision, Acceleration, Aircraft, Jets, Gravity.

By observing apparent displacements of a real target, and visual afterimages during weightlessness preceded by positive or negative acceleration, it was possible to identify these displacements as a special case of the ''elevator illusion,'' as opposed to the oculogravic illusion. Positive and negative linear acceleration, as well as weightlessness, was obtained for this purpose in jet aircraft. (Author)

17. METALLURGY

AD-418 033 Div. 17, 4
OTS price $2.25

Air Force Materials Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
INVESTIGATION INTO THE TUNGSTEN-RICH REGIONS OF THE BINARY SYSTEMS TUNGSTEN-CARBON, TUNGSTEN-BORON AND TUNGSTEN-BERYLLIUM, by H. J. Goldschmidt, E. A. Catherall, W. M. Ham and D. A. Oliver. July 63, 80p.
Contract AF61 052 306, Proj. 7351, Task 735101
ASD TDR62 25, pt. 2 Unclassified report

Descriptors: (*Tungsten, Phase studies), (*Phase studies, Tungsten), (*Beryllium, Solubility), (*Carbon, Solubility), (*Boron, Solubility), Solid solutions, Eutectics, Tungsten compounds, Beryllium compounds, Intermetallic compounds, Tungsten alloys, Carbon alloys, Beryllium alloys, Boron alloys, High-temperature research, Hardening, Tantalum alloys, X-ray photography, Crystal lattices, Metallography, Aging (Materials), Chemical analysis, Tables, Data.

This report deals with the solid solubility of boron and of beryllium in tungsten, together with the attendant problems concerning the tungsten rich borides and beryllides in equilibrium with W, and which are liable to precipitate. Brief supplementary data are given on the W-C system, following the previous investigation. The study of the solubility of boron in tungsten shows this to be approximately 0.2 atomic %B at 2500 C, decreasing with temperature. The atomic nature of this solution presents a special problem in that it can be interstitial and substitutional. W-W2 B forms a eutectic system, the eutectic temperature being about 2600 C. A high boron boron compound WB4 has been observed. In the tungsten-beryllium system which presented some special hazards which are described, the solubility of Be in W is found to be approximately 5 atomic % Be at the eutectic temperature. The solubility limit does not vary appreciably down to 1800 C and decreases to about 3 atomic % Be in the 1000/1300 C range. The solid solution is substitutional, and lattice spacing variations are described. (Author)

AD-418 081 Div. 17
OTS price $1.60

IIT Research Inst., Chicago, Ill.
DISPERSION-STRENGTHENED VANADIUM ALLOYS. Bimonthly rept. no. 4, 14 June 63-13 Aug 63. 9 Sep 63, 12p. Rept. no. IITRI B6007 4
Contract N600 19 59567
Unclassified report

Descriptors: (*Vanadium alloys, Dispersion hardening), (*Niobium alloys, Dispersion hardening), (*Tantalum alloys, Dispersion hardening), Powder metallurgy, Sintering, Heat treatment, Oxides, Carbides, Titanium alloys, Hafnium alloys, Zirconium alloys, Carbon alloys, Creep, Rupture, Stresses, Hardness, Coatings, Cerium compounds, Hafnium compounds, Lanthanum compounds, Yttrium compounds, Zirconium compounds.

Dispersion-strengthening mechanisms are being investigated as a means of improving creep and stress-rupture properties of vanadium-niobium-base alloys. Heat-treating studies of arc-melted and wrought materials containing hafnium or zirconium with carbon indicated that compositions based on V-60w/oNb are comparatively susceptible to hardening by traces of atmospheric contaminants after prolonged exposure at 2000 and 2300 F. Virtually no room-temperature hardening was observed in V-40w/oNb-30w/o Ta base alloys exposed to the same annealing atmospheres. Carbide and oxide dispersants were produced in a V-60w/oNb-1w/o Ti matrix by powder metallurgy techniques. After sintering the compacted powders for 10 minutes at 2800 F and annealing for 16 hours at 2400 F, compositions containing HfC and ZrC exhibited little hardening of the V-Cb-Ti alloy matrix. Dispersions of yttria, lanthana, and hafnia produced large increases in the room-temperature hardness of the matrix after sintering and annealing. (Author)

AD-418 153 Div. 17
OTS price $31.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
INVESTIGATION OF HEAT RESISTANT ALLOYS (Issledovaniya po Zharoprochnym Splavam), by I. P. Bardin and G. V. Kurdyumov. 19 June 63, 723p.
FTD FTS9848 Unclassified report

Trans. from Izdatel'stvo Akademii Nauk SSSR, pp. 1-430, Moskva - 1958.

Descriptors: (*Heat resistant metals and alloys, Reports), Powder metallurgy, Molybdenum alloys, Microstructure, Hardness, Electrical conductance, Creep, Steel, Aging (Materials), High temperature research, Thermodynamics, Chromium alloys, Cobalt alloys, Test methods, Heat of activation, Metals, Diffusion, Oxides, Zinc, Iron alloys, Aluminum alloys, Deformation, Nickel alloys, Solid solutions, Alloys, Crystals, Adsorption, X-ray diffraction analysis, Grain structure (Metallurgy), Niobium alloys, Vanadium alloys, Copper alloys, Titanium alloys.

AD-418 223 Div. 17
OTS price $18.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
AVIATION PHYSICAL METALLURGY (Aviatsionnoye Metallodeniye),
by S. M. Vinarov. 19 Aug 63, 1v.
FTD TT62 1678 Unclassified report

Trans. from Gosudarstvennoye Nauchno-Tekhniches-koye Izdatel'stvo Oborongiz, pp. 1-220, 1962.

Descriptors: (*Alloys, Metallurgy), Theory, Heat treatment, Magnesium alloys, Beryllium alloys, Aluminum alloys, Titanium alloys, Temperature, Fatigue (Mechanics), Deformation, Fracture (Mechanics), Strain (Mechanics), Hardening, Structural properties, Textbook, Mechanical properties, Tables, Transformation, High temperature research, Nickel alloys, Steel, Stainless steel, Refractory metals and alloys, Equation of state, Crystal lattice defects, Grain boundaries, Crystal structure, Phase studies, Solid solutions.

AD-418 229 Div. 17, 8
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Frce Base, Ohio.
THERMONIC EMISSION OF ALLOYS OF TUNGSTEN WITH TITANIUM AND HAFNIUM AND ITS DEPENDENCE ON THE PRESSURE OF OXYGEN,
by B. Ch. Dyubua and A. I. Pekarev. 17 July 63, 16p.
FTD MT63 37 Unclassified report

Trans. from Radiotekhnika I Elektronika, 7:9, pp. 1566-1573, 1962.

Descriptors: (*Tungsten alloys, Thermionic emission), Titanium alloys, Hafnium alloys, Oxygen, Pressure, Work function, Solid solutions, Phase studies, Oxides, Microstructures, Impurities.

The dependence of work functions of alloys of tungsten with titanium and hafnium on their composition is considered. It is shown that the work function of solid solutions appears less than the work function of pure metals. Solid solutions and chemical compounds one should consider as new emitters, the properties of which are distinguished from properties of pure metals. The influence of oxygen on emission of alloys is considered. (Author)

AD-418 261 Div. 17, 14
OTS price $2.60

United Aircraft Corp., East Hartford, Conn.
ANALYTICAL AND EXPERIMENTAL INVESTIGATIONS OF THE FRACTURE MECHANISMS OF CONTROLLED POLYPHASE ALLOYS.
Quarterly progress rept. no. 3, 30 Apr-29 July 63,
by J. A. Ford and R. W. Hertzberg. 31 Aug 63, 23p. Rept. no. B910068 3
Contract N600 19 59361
Unclassified report

Descriptors: (*Alloys, Metallic textiles), (*Metallic textiles, Failure (Mechanics)), (*Composite materials, Metallic textiles), Stresses, Tensile properties, Elasticity, Fractography, Fibers, Aluminum, Aluminum alloys, Nickel alloys, Microstructure, Strain (Mechanics), Copper alloys, Crystal structure, Chromium alloys, Fracture (Mechanics), Single crystal.

The results of continued investigations of the unidirectionally solidified eutectic alloys Cu-Cr, Al-CuAl2, and Al-Al3Ni are contained in this third quarterly progress report. The fractographic analysis of unidirectionally solidified Cu-Cr tensile specimens whose temsile axes were oriented at an angle of 45 deg to the growth direction has been completed and results indicate that: a) the fractured surface was approximately parallel to the Cr whisker length and at 45 deg to the tensile axis, and b) the direction of shear failure was parallel to the line of the fibers. (Author)

AD-418 300 Div. 17
OTS price $2.75

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
OXIDATION RESISTANT HIGH TEMPERATURE PROTECTIVE COATINGS FOR TUNGSTEN.
Rept. for 1 Apr 62-1 Apr 63,
by H. J. Nolting and R. A. Jefferys. May 63, 127p.
Contract AF33 616 8188, Proj. 7312, Task 731201
ASD TDR63 459 Unclassified report

Descriptors: (*Tungsten, Protective treatments), (*Refractory metals and alloys, Coatings), (*Coatings, Space environmental conditions), Refractory coatings, Ceramic coatings, Metal coatings, Cermets, Composite materials, Diffusion, Silicon, Titanium, Zirconium, Boron, Oxidation, Oxides, Silicides, High temperature research, Sheets.

Three coating systems were developed that protected 60 mil tungsten sheet from oxidation in air at elevated temperatures. These composites, applied by the vacuum pack process, were; silicon-tungsten; titanium + zirconium + silicon-tungsten, and; titanium + zirconium-boron + silicon-tungsten. A laboratory scale process for application of each coating to tungsten sheet was developed and optimized. Oxidation characteristics of the coated systems in air under various static and cyclic conditions were determined from 1600 to 3650 F with several hours protection being achieved under cyclic conditions at 3550 F. Tensile tests were conducted on two of the three systems at regular temperature increments from room temperature to 3300 F under various environmental conditions. Stress oxidation, thermal shock, and hot gas erosion tests were also conducted on the diffraction patterns were determined on the silicon-tungsten and titanium + zirconium + silicon-tungsten composites in the coated and exposed conditions. (Author)

AD-418 326 Div. 17
OTS price $8.10

Central Inst. for Industrial Research (Norway).
MECHANICAL PROPERTIES OF NIOBIUM.
Final rept. for Jan 61-July 63,
by Torleif Lindtveit, Ingard Kvernes and Paul Storvik. July 63, 1v. Sl Publ. 404
Contract N11MWP N61
Unclassified report

Descriptors: (*Niobium, Mechanical properties), (*Single crystals, Niobium), Zone melting, Electron beams, Tensile properties, Low temperature research, High temperature research, Shear stresses, Strain (Mechanics), Stresses, Recrystallization, Metallography, Hardness, X-ray diffraction analysis, Deformation, Niobium alloys, Zirconium alloys, Chemical analysis, Temperature, Chromalographic analysis, Gases.

Single crystals of niobium were prepared by electron beam floating zone melting. Tensile test specimens were formed in a spark erosion machine and tensile tests have been carried out

in the temperature range -196 to 1100 C. Resolved true shear stress is plotted against strain and the effect of orientation on the stress-strain behaviour at the temperature tested is discussed. The recrystallization behavior of electron beam melted niobium (99.85%) was studied by means of metallographic examination, hardness measurements and x-ray analysis. Some initial work on the recrystallization behaviour of niobium zirconium alloys was performed. (Author)

AD-418 388 Div. 17
OTS price $7.60

Pressure Technology Corp. of America, Woodbridge, N. J.
A STUDY TO DETERMINE THE DEFORMATION CHARACTERISTICS OF BERYLLIUM AND TUNGSTEN UNDER CONDITIONS OF HIGH HYDROSTATIC PRESSURE.
Final rept., 14 Nov 62-14 May 63.
Sep 63, 59p.
Contract N600 19 59430
Unclassified report

Descriptors: (*Beryllium, Deformation), (*Tungsten, Deformation), Hydrostatic pressure, Tensile properties, Compressive properties, Extrusion, Brittleness, Stresses, Shear stresses, Creep, Ductility, Transition temperature, Temperature, Pressure.

This study of deformation of tungsten and beryllium under fluid pressure by tensile, compressive, and fluid-to-fluid extrusion tests has yielded information on stresses and maximum deformations as a function of pressure. Pressure has been shown to increase the number of modes of deformation of monocrystalline beryllium. There are provided accompanying analyses and suggestions for use in metalworking. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-417 870 Div. 18
OTS price $2.60

Army Natick Labs., Mass.
VISIBILITY IN A TROPICAL FOREST,
by Robert L. Anstey. Aug 63, 24p.
ANL Special rept. S3 Unclassified report

Descriptors: (*Visibility, Forestry), (*Forestry, Visibility), (*Tropical regions, Visibility), Trees, Density, Camouflage, Analysis, Military strategy.

Horizontal visibility in a tropical deciduous forest in Eastern Panama was measured in October 1962 in the course of Project Swamp Fox II. The total of 360 observations consisted of 4 observations at each of 90 sites. The maximum distance at which a camouflaged object moving away from the observer could be identified in this type of forest was 100 feet; the average distance, approximately 50 feet. The maximum distance that a pre-positioned camouflaged object could be identified was 60 feet; the median distance was approximately 22 feet. A study of the spacing of tree trunk diameters disclosed that an observer standing in the center of randomly selected circles with a 15-foot radius would find that an average of 30 percent of the peripheries would be obstructed to view by tree trunks without foliage, and 66 to 88 percent of the peripheries of quadrats measured at 90 feet on a side would be obstructed to the viewer from central points. It was also found that some unobstructed sight lines of 100 to 300 feet could be obtained in this type of forest if the foliage were removed. (Author)

AD-417 921 Div. 18
OTS price $5.60

Joint Thai-U.S. Combat Development and Test Center (Thailand).
EVALUATION OF TWO BREAKWIRE INTRUSION DETECTION DEVICES,
by Joseph P. Martino. July 63, 46p.
Unclassified report

Descriptors: (*Detection, Enemy personnel), (*Enemy personnel, Detection), Wire, Electrical equipment, Monitors, Circuits, Defense systems, Effectiveness.

This report describes tests conducted on two different types of breakwire intrusion detectors, the AN/GSS-9, and the Scope Inc. BC200A. Tests were conducted with the wire laid directly on the ground; with the wire strung at various heights over a trail; with the wire strung through a second-growth forest; and with the wire strung through a pond. It was found that the devices do not work satisfactorily when the wire is laid on the ground. The devices function properly if the wire is strung at least 15 cm. above a trail. In heavy forest, considerable wire breakage was experienced both during stringing the wire and when the wire was left up overnight. It was found that laying the wire in a pond did not degrade performance seriously, indicating that heavy rain will not affect the operation of the devices. Recommendations for improvement are given. (Author)

AD-417 922 Div. 18
OTS price $5.60

Joint Thai-U.S. Combat Development and Test Center (Thailand).
EVALUATION OF THE PARAFFIN TEST FOR USE BY COUNTERINSURGENCY FORCES,
by Joseph P. Martino. July 63, 50p.
Unclassified report

Descriptors: (*Counterinsurgency, Training), (*Detection, Firing tests (Ordnance)), Weapons, Enemy personnel, Police, Military personnel, Armed forces (United States), Defense system.

This report describes an evaluation of the Paraffin Test, used to detect whether or not a suspect has fired a gun. The evaluation concluded that soldiers could be trained to apply the test, and that is could be applied quickly and effectively under field conditions. It is recommended that the test be adopted for use by the Royal Thai Army. (Author)

AD-418 084 Div. 18
OTS price $13.50

Stanford Research Inst., Menlo Park, Calif.
DEFENSE ANALYSIS CENTER BIBLIOGRAPHY AND ABSTRACTS.
Sep 63, 1v.
Unclassified report

Descriptors: (*Bibliographies, National defense), (*National defense, Bibliographies).

19. NAVIGATION

AD-418 371 Div. 19, 1
OTS price $3.60

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
ANALYSIS OF STABILIZATION OF OPTICAL LANDING SYSTEM AGAINST SHIP ROLL AND PITCH,
by R. B. Quinn. Oct 62, 32p.
NAVWEPS Rept. no. R5 62 39 Unclassified report

Descriptors: (*Instrument landings, Optical equipment), (*Optical instruments, Landing aids), (*Landing aids, Aircraft carriers), Stabilization systems, Roll, Pitch (Motion), Ships, Stabilization, Lenses, Numerical analysis, Carrier landings, Glide path systems, Equations.

An analysis has been made of the stabilization against ship roll and pitch of the point-stabilized Fresnel Lens Optical Landing System when the system has the lens roll provision for adjustment of hook-to-eye distance. The analysis shows that use of simple constant roll and pitch correction factors provides more accurate stabilization than the precision of construction of the system or the precision of the stable element input signals generally permits. Choice of the point to be stabilized is shown not to be critical, and a point somewhat nearer than the 2500 ft commonly used is shown to have an advantage. As a result of the analysis it appears that the theoretical imperfections of point-stabilization are quite small; that the effects of the theoretical imperfections should be scarcely perceptible; and that a possible, more ideal line-stabilized system could scarcely be expected to operate more effectively when the normal degradations of operation are encountered. (Author)

AD-418 374 Div. 19, 1
OTS price $1.60

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
ANALYSIS OF STABILIZATION OF OPTICAL LANDING SYSTEMS AGAINST SHIP ROLL AND PITCH - "CENTERLINE" SYSTEM AND PLAT,
by R. B. Quinn. July 63, 13p.
NAVWEPS Rept. no. R5 63 2 2 Unclassified report

Descriptors: (*Instrument landings, Aircraft carriers), (*Optical instruments, Landing aids) (*Landing aids, Television display systems), Carrier landings, Optical equipment, Stabilization systems, Television cameras, Roll, Pitch (Motion), Stabilization, Glide path systems, Numerical analysis, Equations.

A study has been made of the stabilization of the Pilot Landing Aid Television System devised for monitoring carrier aircraft landings, and of the stabilization of a proposed, centerline-located Optical Landing System which might relieve pilots of looking to the side during a critical phase of the approach. Stabilization of the PLAT system is only partial, and the quantitative consequence is determined. The centerline-located OLS is shown to have lost its provision for simple accommodation of various H/E values and to be incapable of line-stabilization. However, point-stabilization, which is possible, is probably adequate. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-417 976 Div. 20, 4, 25
OTS price $2.60

Kansas U., Lawrence.
INTERMEDIATE STATE REORIENTATION OF COBALT-57 NUCLEI ALIGNED IN CERIUM ZINC NITRATE,
by W. W. Strohm, Jr. and R. C. Sapp. 15 May 63, 20p. Technical rept. no. 4
Contract Nonr277500, Proj. NR018 202 Unclassified report

Descriptors: (*Cobalt, Isotopes), (*Radioactive decay, Cobalt), (*Gamma rays, Polarization), Nuclei, Nuclear spins, Theory, Cerium compounds, Zinc compounds, Nitrates, Single crystals, Hydrates, Cryogenics, Ions, Equations, Bibliographies, Attenuation, Radioactive isotopes.

Radiation pattern and linear polarization of gamma rays from decay of Co-57 aligned at low temperatures by Bleaney's method in the Y-sites of cerium zinc nitrate were studied for evidence of intermediate state reorientation in this crystal. Influence of spin-spin interactions should be negligible on theoretical grounds. Comparisons are made with Steenberg's theory of intermediate state reorientation by static, isotropic hfs coupling in the hard core limit, and with results of another nuclear alignment experiment involving the same isotope. (Author)

AD-418 025 Div. 20, 30
OTS price $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE RGI-20 RADIAC SYSTEM - A WIDE RANGE BETA-GAMMA INSTRUMENT. II. THE SOLID STATE PULSED GM TUBE LOW RANGE ACCESSORY PROBE,
by W. F. Joseph. 2 Aug 63, 25p.
Task 6192
NRDL TR664 Unclassified report

Descriptors: (*Radiation measurement systems components, Gamma counters), (*Radiation monitors, Beta particles), Transistor amplifiers, Instrumentation, Measuring devices (Electrical and electronic), Probes (Electromagnetic)

A plug-on low range accessory, consisting of a main unit and a cable-connected probe has been developed for the RGI-20 radiac system. The solid state circuit for pulsed GM tube operation is contained in the main unit whose dimensions are approximately 2 x 2-1/2 x 6 in. The GM tube is mounted in a cable-connected probe with side and end beta window provisions. Ranges covered by the unit are 0-1, 0-10, 0-100, and 0-1000 millirad/hr; temperature affects accuracy by less than ±20% from -40 to +50 C. The operating power, rate-computing circuit, and scale-changing meter display are provided by the basic high range (0-1000 rad/hr) RGI-20 module. (Author)

AD-418 059 Div. 20, 25
OTS price $7.60

Columbia Radiation Lab., New York.
RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM.

Quarterly progress rept. no. 2, 16 Mar-15 June 63,
by R. Novick. 15 June 63, 66p. Rept. no. CU6 63
Contracts DA36 039sc90789 and Nonr26 645, Projs. 3A99 20 001 09 and NR372 101
Unclassified report

Descriptors: (*Nuclear magnetic resonance, Decay schemes), (*Laser, Spectrum analyzer), K-band, Nuclear spins, Microwave spectroscopy, Cadmium, Isotopes, Hyperfine structure, Magnetrons, Beams (Electromagnetic), Molecules, Color centers, Infrared optical, Radioastronomy, Cryogenics, High frequency, Superconductors, Specific heat, Measurement, Ruby, Sensitivity, Rubidium, Planetary atmospheres, Solid state physics, Detection, Lithium, Atomic spectroscopy, Electromagnetic waves, Nuclear magnetic moments, Helium, Nuclei.

AD-418 076 Div. 20, 22
OTS price $9.60

California Forest and Range Experiment Station, Berkeley.
PREDICTION OF FIRE SPREAD FOLLOWING NUCLEAR EXPLOSIONS,
Final rept.
1963, 110p.
Contract OCD OS62 131
PSW 5 Unclassified report

Descriptors: (*Nuclear explosions, Fires), (*Fires, Nuclear explosions), Mathematical logic, Weather forecasting, Propagation, Forest fires, Firefighting vehicles, Reviews, Bibliographies, Mathematical models, Topographic cameras, History, Aerial photography, Fuels, Geography, Probability, Ignition, Personnel.

Mass fires are likely to follow a nuclear attack. Since it is important to the civil defense program to be able to predict rate, duration, and extent of spread of such fires, the Office of Civil Defense, U. S. Department of Defense, issued a joint contract to the Forest Service and to United Research Services, Inc., to study this field. We surveyed the literature, interviewed some 30 urban and wildland fire-control personnel, studied nearly 2,000 fires, collected 1,687 rates of spread, and determined the conditions when fires would not spread significantly and the conditions when fires would be extinguished in the absence of effective firefighting action. (Author)

21. NUCLEAR PROPULSION

No Entries

22. ORDNANCE

AD-417 863 Div. 22
OTS price $1.60

Stanford Research Inst., Menlo Park, Calif.
SHOCK SENSITIVITY OF LOW DENSITY GRANULAR EXPLOSIVES,
by Marjorie W. Evans, C. M. Ablow, B. O. Reese and A. B. Amster. 1963, 17p.
Contract AF49 638 1124
AFOSR J1016 Unclassified report

Descriptors: (*Explosive materials, Sensitivity), (*Shock waves, Explosive materials), (*Propellant grains, Sensitivity), Detonation waves, Density, Ammonium compounds, Perchlorates, Temperature, Models, Gases, Attenuation, PETN.

The structure of shocks which initiate a detonation wave in low density granular explosives is discussed. Measurements of shock sensitivity of ammonium perchlorate, PETN, and mixtures of the two are reported. The data are interpreted in terms of temperature of the receiver on the basis of two simple models: the equilibrium temperature of a locking solid assuming complete compaction, and the temperature of the interstitial gas at the moment the shock has entered the receiver. (Author)

AD-417 885 Div. 22
OTS price $5.60

Naval Weapons Lab., Dahlgren, Va.
TALOS STRUCTURAL FIRING TEST ABOARD THE USS ALBANY (CG-10),
by J. W. Loving, T. I. Dodson, P. E. Wine and C. J. Mazzella. 29 Aug 63, 58p.
NWL 1877 Unclassified report

Descriptors: (*Weapons, Firing tests), (*Boosters, Firing tests), Safety, Launching, Blast, Personnel, Air, Temperature, Measurement, Exhaust gases, Toxicity, Ships, Structures, Navy.

Twelve TALOS MARK 11 MOD 1 boosters with concrete slugs were fired aboard the USS ALBANY (CG-10) to investigate the adequacy of the protection for the TALOS launching system personnel against blast effects and to determine the effects of the booster exhaust on the ship's structure. During the test series, measurements of toxic gas leakage into personnel areas, sound pressure levels, structural strains and deflections, temperatures and exhaust stream pressures were obtained. The results indicated no major structural deficiencies. There was some gas and smoke leakage into personnel areas adjacent to the launcher, exposure of equipment to high temperatures and superficial structural damage. (Author)

AD-418 204 Div. 22, 30
OTS price $6.60

Naval Ordnance Test Station, China Lake, Calif.
INSTRUMENT OPERATIONS ON TEST DEPARTMENT RANGES.
July 63, 60p.
NOTS TP2692, rev. 1 Unclassified report

Descriptors: (*Ordnance laboratories, Naval research laboratories), (*Guided missile ranges, Instrumentation), Test facilities, Test methods, Photographic equipment, Optical equipment, Telemeter systems, Data processing systems, Guided missile tracking systems, Meteorology, Meteorological instruments, Weather forecasting.

The Test Department is responsible for conducting test programs for the Bureau of Weapons, its agencies and contractors. One of the primary program requirements is the gathering of complete and accurate data to meet complex and stringent specifications. This information is compiled from photographic and electronics records. The Instrument Operations Division provides and operates the major portion of the Department's facilities that produce these records. To accomplish the various tasks which comprise this job, the Instrument Operations Division is organized into five branches, each responsible for a specific segment of overall instrument operations. These branches include the Photographic Laboratory Branch, the Optical Instrumentation Branch, the Timing and Telemetry Branch, the Metric Electronics Branch, and the Atmospheric Studies Branch. The branch names imply the various aspects of the Division mission that they handle. (Author)

AD-418 356 Div. 22
OTS price $2.60

Picatinny Arsenal, Dover, N. J.
METHYL CELLULOSE AS A NITROGLYCERIN BARRIER FOR COMBUSTIBLE CARTRIDGE CASES,
by Sydney Axelrod. Aug 63, 19p.
PA TR3104 Unclassified report

Descriptors: (*Cartridge cases, Nitrocellulose), (*Nitroglycerin, Absorption (Physical)), (*Coatings, Cellulosic plastics), Organic coatings, Storage.

Sections from XM156 and XM157 felted nitrocellulose combustible cartridge cases were stored at 122 F with M17 and T28E1 propellants, respectively. The changes in (1) weight, (2) durometer hardness, and (3) thickness were determined after one, three, and twelve months. The data shows that a methyl cellulose coating 0.001 to 0.002 inches thick noticeably retards the migration of nitroglycerin from the propellants into the combustible cartridge cases. (Author)

AD-418 369 Div. 22
OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
DEVELOPMENT OF CARTRIDGE, POWDER ACTUATED CUTTER, XM83, FOR REEFING LINE CUTTER,
by J. M. Farrell. June 63, 19p.
FA R1685 Unclassified report

Descriptors: (*Cartridges (PAD), Design), (*Parachute fabrics, Cutting tools), Parachutes, Air drop operations, Timing devices, Time-delay fuzes.

Cartridge, Powder Actuated Cutter, XM83, was developed as a replacement for the explosive actuator in the MC-1 reefing line cutter used with heavy duty parachute assemblies. Firing tests demonstrated that this cartridge, loaded with 6 grains of M2 propellant, 2 grains of A4 black powder, and an M29A1 primer, developed the pressure required by the cutter to sever the nylon line specified in requirements. (Author)

Division 23 - PERSONNEL AND TRAINING
Division 24 - PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES
Division 25 - PHYSICS

23. PERSONNEL AND TRAINING

AD-417 937 Div. 23
OTS price $1.60

Naval Personnel Research Activity, Washington, D. C.
THE EFFECTS OF SEQUENCE OF SCHOOL AND FLEET TRAINING ON THE RETENTION OF ENLISTED PERSONNEL,
by John M. Proctor. June 63, 13p.
NPRA Research rept. 63 1 Unclassified report

Descriptors: (*Naval personnel, Military training), (*Military training, Effectiveness), (*Recruiting, Naval personnel).

The effects of the sequence of school and fleet training on the retention of enlisted personnel were examined. Two training sequences were employed: (1) the ''School-First,'' or conventional order, in which men are transferred from recruit training centers to Class ''A'' school and then to fleet assignments; and (2) the ''Fleet-First,'' or experimental, condition in which men were transferred from recruit training centers to the fleet for approximately six months, then to Class ''A'' school, and finally back to the fleet. Men who were guaranteed assignment to Class ''A'' schools were labelled ''Committed.'' All other men in the sample were labelled ''Uncommitted.'' Enlisted personnel in four ratings (Machinist's Mate, Storekeeper, Radioman, Electronics Technician) were assigned to five conditions: (1) ''Committed, School-First;'' (2) ''Committed, Fleet-First;'' (3) ''Uncommitted, School-First;'' (4) ''Uncommitted, Fleet-First;'' and (5) ''Apprentice.'' The results indicated that, in general, there was little difference between the retention rates of personnel who were assigned either to the ''School-First'' or ''Fleet-First'' conditions. However, the relative advantage of ''School-First'' or ''Fleet-First'' conditions did vary both within the ''Committed'' and ''Uncommitted'' conditions, and within rating. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

No Entries

25. PHYSICS

AD-417 809 Div. 25, 8
OTS price $4.60

Eagle-Picher Research Labs., Miami, Okla.
GALLIUM PHOSPHIDE DEVICES.
Quarterly technical rept. no. 2, 14 Mar-14 June 63,
by Louis E. Stone, J. S. Roderique, Jno. E. Budiselic, George N. Webb and Lloyd W. Brown.
14 July 63, 42p.
Contract DA36 039amc00103
Unclassified report

Descriptors: (*Semiconductor devices, Single crystals), (*Gallium compounds, Phosphides), (*Single crystals, Epitaxial growth), (*Crystal growth, Single crystals), Synthesis (Chemistry), Diodes (Semiconductor), Iodine, Spectra (Infrared), Spectra (Visible & ultraviolet), Oxides, Impurities, Chlorides, Transport properties, Arsenides, Laboratory equipment, Recovery, Manufacturing methods.

The synthesis of gallium phosphide has been improved in purity of product, recovery efficiency, and reproducibility. Careful control of process temperatures and flow rates has been a major factor in this improvement and exploits the inherent purification of the phosphorus. Alternative vapor synthesis systems have been explored without practical success. The melt growth was impeded by furnacing difficulties, which have been resolved, and melt growth studies are being pursued. Epitaxial growth of gallium phosphide layers of superior quality has been accomplished using iodine transport in both sealed ampoule and open-flow techniques. Diffused, alloyed and epitaxial gallium phosphide diodes have been fabricated and tentative evaluation carried out. Evaluation of optical properties of early bulk gallium phosphide material has been carried out. Results closely agree with theoretical physical properties. (Author)

AD-417 848 Div. 25, 14
OTS price $1.10

Frick Chemical Lab., Princeton U., N. J.
MAXIMUM RELAXATION TIMES IN POLYTETRAFLUOROETHYLENE,
by M. Takahashi and A. V. Tobolsky. Aug 63, 6p.
Contract Nonr185807, Proj. NR356 377
ONR Technical rept. RLT64
Unclassified report

Descriptors: (*Halocarbon plastics, Relaxation time), (*Relaxation time, Halocarbon plastics), Dissociation, Viscosity, Melting, Temperature, Transition temperature.

AD-417 861 Div. 25
OTS price $2.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
EFFECT OF MICROWAVE RADIATION ON THE IONIZED GAS BEHIND A STRONG NORMAL SHOCK WAVE,
by K. T. Yen. July 63, 19p. Rept. no. R63 SD60
Contract AF30 602 1968
Unclassified report

Descriptors: (*Shock waves, Ionization), (*Gas ionization, Microwaves), Temperature, Gases, Energy, Heating, Differential equations, Integrals, Pressure, Density, Velocity.

An analytical study of the interaction between microwaves and a fully-ionized gas behind a normal shock wave is presented. The governing differential equations derived by a quasi-steady analysis are used to obtain the non-dimensional parameters and integrated to yield the first integrals of the momentum and energy equations. A modified Prandtl relation is derived from which the final equilibrium state of the ionized gas can be found. Ionization is seen to increase the final equilibrium density, while microwave heating tends to reduce its value. It is further shown that thermal choking of the ionized gas occurs at a critical microwave power level, which is a function of the Mach number ahead of the shock wave, the reflection coefficient of the microwave, and the ionization potential expressed in terms of the neutral gas temperature ahead of the shock wave. At higher power levels the shock wave moves upstream allowing additional microwave heating of the ionized gas. A formula is given for the determination of this equivalent higher Mach number.

At a sufficiently high power level (but slightly below the critical value), the mean gas temperature is shown to attain a peak value higher than its final equilibrium value. This peak temperature actually represents the upper bound of the mean gas temperature for a given initial Mach number. (Author)

AD-417 869 Div. 25, 2, 8
OTS price $9.10

Ohio State U. Research Foundation, Columbus.
THE INTERACTION OF ELECTROMAGNETIC WAVES WITH SOME NATURAL SURFACES,
by William H. Peake. 30 May 59, 103p. Rept. no. 898 2
Contract AF33 616 6158, Proj. 9 13 4108, Task 41131
Unclassified report

Descriptors: (*Electromagnetic waves, Scattering), (*Scattering, Surfaces), Statistical functions, Terrain, Radar reflections, Radar, Microwave frequency, Terrain models, Polarization, Surface temperatures, Beams, Equations, Integral transforms, Plants, Cylindrical bodies, Electric fields, Magnetic fields, Integration, Propagation, Spheres, Asphalt, Attenuation, Blackbody radiation, Radar echo areas, Absorption.

It has been shown that the 'bi-static' or 'differential' scattering coefficients gamma sub hh, etc., may be used to determine a number of properties of the interaction of electromagnetic radiation with natural surfaces, in particular the back-scattering (radar cross-section) the albedo, and the absorption coefficient. By making use of the reciprocity relations satisfied by the scattering coefficients, it is then possible to derive Kirchhoff's radiation law in a form which accounts for the angular dependence and polarization dependence of the emission and absorption coefficients, and predicts them in terms of the gammas. Thus it has been shown that once the gammas are known, both the scattering and the radiometric properties of the surface may be found in terms of them. In applying the general results to actual terrain surfaces, two models have been suggested for two commonly encountered types of surface, for which the scattering coefficients have been calculated in detail. (Author)

AD-417 880 Div. 25, 20
OTS price $7.60

Oklahoma U., Norman.
A DIRECT METHOD FOR MEASURING LIFETIMES OF EXCITED ATOMIC STATES AND ITS APPLICATION TO HELIUM,
by Thomas M. Holzberlein. May 63, 118p.
Contract AF49 638 639, Proj. 9751, Task 37511
AEC NP12903 Unclassified report

Doctoral thesis.

Descriptors: (*Helium, Atomic properties), (*Decay schemes, Measurement), Excitation, Photons, Gases, Photomultipliers, Sequences, Generators, Phase shifters, Electronic equipment, Capacitance.

AD-417 886 Div. 25
OTS price $1.10

Rochester U., N. Y.
(No title),
by M. F. Kaplon. 26 Aug 63, 8p.
Grant AF AFOSR62 32
AFOSR 5285 Unclassified report

Descriptors: (*Research program administration, Personnel), Charged particles, Cosmic rays, Gamma rays, Propagation, Particle accelerator techniques, Energy, Nucleous, Measurement, Detection.

AD-417 992 Div. 25, 15
OTS price $2.60

Uppsala U. (Sweden).
ON THE INVERSION OF CYCLIC MATRICES,
by Jean-Louis Calais and Klaus Appel. 1 May 63, 23p. Technical note 96
Contract AF61 052 351
ARL 63 186 Unclassified report

Descriptors: (*Solid state physics, Crystals), (*Matrix algebra, Numerical analysis), Series, Equations, Integrals, Atomic orbitals, Crystal lattices, Functions, Polynomials, Mathematical model, Real variables, Complex variables, Atoms, Brillouing zones, Tables, Transformations (Mathematics).

The inversion of the overlap matrix in LCAO-calculations of crystals is discussed for the general case, when an arbitrary number of neighbours is taken into account. Particular attention is paid to the numerical aspects of the problem. (Author)

AD-418 014 Div. 25, 17
OTS price $5.60

Harvard U., Cambridge, Mass.
A STUDY OF SOLID-SOLID PHASE EQUILIBRIUM BOUNDARIES AT HIGH PRESSURES AND TEMPERATURES,
by Peter M. Bell. 30 Aug 63, 46p. Scientific rept. no. 1
Contract AF19 604 7319, Proj. 5621, Task 562101
AFCRL 63 354 Unclassified report

Descriptors: (*Solid solutions, Phase studies), (*Phase studies, Solid solutions), High-pressure research, High-temperature research, Quartz, Calcite, Pyrites, Minerals, Aluminum compounds, Silicates, Solid state physics, Crystal structures.

The results of investigations in the systems quartz-coesite (SiO_2), calcite-aragonite ($CaCo_3$), coesite-stishovite (SiO_2), and pyrite-marcasite (FeS_2) are summarized. New data in these systems include a point on the quartz-coesite equilibrium curve at 350 C, the complete equilibrium curve for calcite-aragonite equilibrium with the exception of one point at 575 C which was redetermined, stishovite synthesis from coesite at 300 C, and marcasite breakdown to pyrite as a function of pressure and temperature. The main purpose of the investigation was to determine phase relations in the system Al_2SiO_5. The results of this investigation are summarized in the phase diagram. New data include reactions in this system at low temperatures and pressures. The results are in agreement with the previous results at higher temperatures and pressures of Clark (Amer. J. Sci., 259, 651-68, 1961) with sillimanite-kyanite equilibrium. (Author)

AD-418 019 Div. 25, 15
OTS price $1.00

IIT Research Inst., Chicago, Ill.
SOLUTIONS FOR NONLINEAR PLANE WAVE EQUATIONS OF ACOUSTICS BY THE METHOD OF FUNCTIONAL INTERRELATIONSHIPS OF DEPENDENT VARIABLES.
Rept. for June-Oct 62,
by Verner J. Raelson. June 63, 24p.
Contract AF33 616 7746, Proj. 7231, Task 723105
AMRL TDR63 64 Unclassified report

Report on Biophysics of Flight.

Descriptors: (*Differential equations, Acoustics), Propagation, Viscosity, Thermal conductivity, Thermal radiation, Series, Fluids, Motion, Gases, Sound, Partial differential equations, Solutions, Transformations (Mathematics), Integration, Pressure, Taylor series, Real variables.

A general formulation of the theory of propagation of finite amplitude waves in a nonlinear, viscous, heat conducting and heat radiating medium is solved by the device of imposing one additional relationship upon the dependent variables. Solutions are offered for two different choices of the additional condition on the dependent variables. The first of these leads to a complete solution in finite form but does not reduce to the nonviscous formulation upon setting viscosity equal to zero. The second solution which fulfills this latter condition is presented in the form both of an infinite series representation and graphically. (Author)

AD-418 020 Div. 25
OTS price $5.60

Catholic U. of America, Washington, D. C.
LINE SHAPE IN THE WING BEYOND THE BAND HEAD OF THE 4.3 MICRON BAND OF CO2,
by Benjamin Winters. 1 June 63, 50p. Scientific rept. no. 1
Contract AF19 604 5558
AFCRL 63 825 Unclassified report

Descriptors: (*Infrared spectroscopy, Carbon dioxide), (*Carbon dioxide, Infrared spectroscopy), (*Absorption, Infrared radiation), Molecular rotation, Vibration, Line spectrum.

Contents: Line Shape Theories -- Natural line width; Doppler broadening; Effect of wall collisions; and Line shapes due to molecular collisions. The wing of the 4.3 micron CO2 band. Apparatus. Experimental Procedure. Experimental Results -- Pure carbon dioxide; Carbon dioxide pressurized with nitrogen; Carbon dioxide pressurized with oxygen; and Relative transmission effects of various foreign gases.

AD-418 026 Div. 25
OTS price $1.25

Air Force Materials Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
SOME SPECIALIZED ATTACHMENTS FOR THE SIEMENS X-RAY DIFFRACTOMETER.
Rept. for Jan 62-Apr 63,
by John J. Renton and William L. Baun. June 63, 41p.
Proj. 7360, Task 736005
ASD TDR63 469 Unclassified report

Report on Materials Analysis and Evaluation Techniques.

Descriptors: (*X-ray diffraction cameras, Attachment), X-ray diffraction analysis, Design, Low temperature research, Mounting brackets, Crystal holders.

Several devices are described which were designed to be used with the Siemens horizontal diffractometer to accomplish specific tasks required in the basic and applied research programs of the AF Materials Laboratory. Instruments which are shown include a low temperature mount for polycrystalline materials, a low temperature mount for single crystals, a simple fiber mount, a two-circle orienter, a true focusing device after the Seemann-Bohlin geometry, and a proposed high temperature attachment. Included are typical applications of the devices to illustrate the functions for which the instruments were designed. (Author)

AD-418 037 Div. 25, 9
OTS price $7.60

RAND Corp., Santa Monica, Calif.
A SIMPLIFIED ANALYSIS OF SKIN FRICTION AND HEAT TRANSFER IN BINARY BOUNDARY-LAYER FLOW.,
by Ting Y. Li. Sep 63, 65p. Memo. RM2872PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Heat transfer, Boundary layer), (*Boundary layer, Heat transfer), (*Ablation, Gas flow), Friction, Thermodynamics, Partial differential equations.

This Memorandum presents a simplified analysis of binary boundary-layer flow on a flat plate. A simple computational method previously used by Meksyn has been extended and applied to the present problem. Analytical formulas of skin friction, surface mass transfer, and heat transfer are derived. The effects on skin friction of various parameters, such as P (Prandtl number); L (Lewis number), and molecular-weight ratio, and heat transfer in binary boundary layers are exhibited explicitly in these analytical formulas. The results agree well with more exact numerical calculations. In addition, some intricate coupling of viscosity, heat conduction, and diffusion is exhibited--for example, coupling between recovery temperature and skin friction, and coupling between conductive heat transfer and diffusion effects. (Author)

AD-418 058 Div. 25
OTS price $5.60

Towne School of Civil and Mechanical Engineering, U. of Pennsylvania, Philadelphia.
APPROXIMATE SOLUTIONS FOR RECTANGULAR ORTHOTROPIC PLATES,
by Jack R. Vinson and Maurice A. Brull. Sep 63, 56p. Technical rept. no. 1
Contract Nonr551 44, Proj. NR064 467
Unclassified report

Descriptors: (*Sheets, Loading (Mechanics), (*Stresses, Mathematical analysis), Statics, Differential equations, Integral equations, Green's function, Deformation, Series, Perturbation theory.

AD-418 079 Div. 25, 15
OTS price $1.60

Wayne State U., Detroit, Mich.
THEORETICAL INVESTIGATIONS ON THE LIGHT SCATTERING OF SPHERES. XIV. THE WAVE LENGTH EXPONENT OF DIFFERENTIAL SCATTERING SPECTRA FOR AN ANGLE OF OBSERVATION OF 90 DEGREES,
by Hari L. Bhatnagar and Wilfried Heller. 10 Aug 63, 12p. Technical rept. no. 7 53
Contract Nonr351100, Proj. 051 380
Unclassified report

Descriptors: (*Scattering, Light), Spectra, Particle size, Intensity, Theory, Analysis, Beams, Equation, Partial differential equation, Monochromatic light, Tables, Spheres.

Exact equations are given for the wavelength exponent of experimental differential scattering spectra, (n sub 90), observed at an angle of

90 with respect to an incident unpolarized beam. Numerical values of the theoretical exponent, n sub 90, are derived from the Mie functions for alpha = 0.5 (0.1) 0.8 (0.2) 6.4 and m = 1.05 (0.05) 1.30. Values of the quantity (partial of (ln(I sub 90/I sub.0 c)w.r.t.m) are also computed for alpha = 0.8 (0.4) 2.4 and the above m-values. Advantages and disadvantages of a practical application of (n sub 90) for particle size determination are enumerated. (Author)

AD-418 093 Div. 25
OTS price $1.60

Illinois Inst. of Tech., Chicago.
PLASTIC PLATE THEORY,
by Philip G. Hodge, Jr. June 63, 9p. DOMIIT rept. no. 1 26
Contract Nonr140604, Proj. NR064 429
Unclassified report

Descriptors: (*Disks, Plasticity), Equations, Bodies of revolution, Geometric forms, Mathematical analysis, Loading (Mechanical), Theory.

It is shown that the governing equations for perfectly plastic flow of plates are generally elliptic, the only exceptions being certain piecewise linear yield conditions and corners of the yield curve. (Author)

AD-418 118 Div. 25, 4
OTS price $1.60

University of Southern Calif., Los Angeles.
ISOTOPE SHIFT AND HYPERFINE STRUCTURE.
Final rept., 1 July 47-31 Aug 63,
by John R. Holmes. 31 Aug 63, 12p.
Contracts Nonr22803 and Nonr22814
Unclassified report

Descriptors: (*Hyperfine structure, Isotopes), (*Isotopes, Hyperfine structure), Nuclear moments, Atomic spectroscopy, Interferometers.

AD-418 125 Div. 25
OTS price $8.60

Stanford Research Inst., Menlo Park, Calif.
HYDRODYNAMIC THEORY AND HIGH PRESSURE FLOW IN SOLIDS.
Final rept.,
by J. O. Erkman. 15 July 63, 89p.
Contract DA49 146XZ095, SRI Proj. PGU3712
DASA 1397 Unclassified report

Descriptors: (*Shock waves, Solids), (*Solids, Shock waves), (*Spallation, Shock waves), (*Hydrodynamics, High pressure research), Attenuation, Mechanical waves, Programming (Computers), Elasticity, Plasticity.

A plane shock wave is induced in a target by hitting the target with a flying plate accelerated to a high velocity by a charge of explosive. The amount of attenuation of the shock wave is determined by observing the velocity of the free surface of the target. It is found that shocks are attenuated more rapidly in Yule marble, Vacaville basalt, and alluvium than predicted by calculations based on the theory of hydrodynamics. Problems concerned with the measurement of the flatness of the flying plates, with the condition of the plates, and with the recording method are discussed. Results of some of the shots in which flyer plates are recovered show that plates projected with a P-60 plane wave generator and 1- or 2-inch-thick charges of Composition B-3 fracture near the back surface of the flyer plate. Because the spalled pieces are thin (about 1/5 of the thickness of the plate), and because the separation of the two pieces of the plate is necessarily small, the results of the attenuation studies are regarded as having considerable validity. A computer code using the artificial viscosity method is used to calculate the flow induced in a target by the impact of a flying plate. (Author)

AD-418 157 Div. 25
OTS price $1.10

South Carolina U., Columbia.
MEASUREMENTS AT MILIMELIMETER AND SUBMILIMETER WAVELENGTHS.
Rept. for 1960-1963.
1963, 6p.
Grant AF AFOSR62 315
AFOSR 5289 Unclassified report

Descriptors: (*Waveguides, Design), (*Millimeter waves, Measurement), Microwave equipment, Bolometers, Ferrites, Calorimeters, Attenuation, Dielectric properties, Magnetic properties.

The development of measurement techniques in the millimeter and submillimeter range has been accelerated by improvements in sources and the development of transmission systems including conventional dominant mode waveguide, TE01 mode circular waveguide, oversized rectangular waveguide and free-space transmission systems with and without beam-guiding techniques. (Author)

AD-418 200 Div. 25
OTS price $13.00

Columbia U., New York.
MAGNETOHYDRODYNAMIC ROTATION OF PLASMAS,
by Kwadwo Ohemen Kessey. 1963, 168p.
Plasma Laboratory Rept. no. 1
Grant AF AFOSR48 63
Unclassified report

Descriptors: (*Plasma jets, Rotation), (*Magnetohydrodynamics, Plasma physics), Plasma physics, Electric fields, Magnetic fields, Axially symmetric flow, Laminar flow, Viscosity, Electrical conductance, Kinetic theory.

The rotation of an incompressible plasma is analyzed for the case when it is confined in an axisymmetrical cylindrical structure impressed with radial electric and axial magnetic fields. The analyses are concerned with steady and transient, one- and two-dimensional laminar flow of a nonviscous and viscous plasma with either small or very large electrical conductivity. The one-dimensional analysis, referred to as the ''Zero Radial Mass Flux'' (ZRMF), involves the azimuthal component of velocity only. The two-dimensional analysis, called the ''Non-Zero Radial Mass Flux'' (NRMF), deals with both the azimuthal and radial components of velocity. On the basis of two physically interesting approximations, the ''flat disc'' and the ''long cylinder,'' analytical solutions have been obtained for both the steady and unsteady velocity and pressure fields. (Author)

AD-418 203 Div. 25
OTS price $3.60

Naval Research Lab., Washington, D. C.
STARK PROFILE MEASUREMENT OF THE LYMAN-ALPHA AND LYMAN-BETA LINES OF HYDROGEN,
by R. C. Elton. 17 July 63, 32p.
Proj. RR002 10 45 5054
NRL Rept. no. 5967 Unclassified report

Descriptors: (*Hydrogen, Spectroscopy), (*Line spectrum, Hydrogen), Shock tubes, Ultraviolet, Spectroscopy, Helium, Electron bombardment, Theory, Density, Plasma physics, Gases, Blackbody radiation, Spectra (Visible & ultraviolet).

AT-type electromagnetic shock tube (Elton, R. C., Griem, H.R., and Kolb, A. C., J. Opt. Soc. Am. 52:605 (1962)) was used for the detailed study of Stark broadened lines in the vacuum ultraviolet. Measurements of the Lyman-alpha profile from an optically thin region (0.03 percent admixture of hydrogen in 40 mm-Hg helium) indicated agreement to within 10 percent with recent calculations (Griem, H. R., Kolb, A. C., and Shen, K. Y., Phys. Rev. 116:4 (1959)) which included the broadening effects due to electron impacts, as opposed to the Holtsmark theory which differs by a factor of approximately 3 on the wings when the theoretical curves are normalized at equal slope. A temperature of 20,500±1,600 degrees K has been determined from a line-to-continuum ratio measurement for helium. Density measurements from the visible continuum gave Ne = (3.6±0.4)10 to the 17th power. The Rankine-Hugoniot equations predicted Ne = (4.8±1.9)10 to the 17th power and T = 20,000±1,000 degrees K from the measured shock velocity. A calculated spectral emissivity of 0.09±0.06 at 1217.7A compares with 0.10±0.02 as found experimentally by adding known amount of hydrogen until saturation occurs. It is thus possible to produce near-blackbody radiation from homogeneous plasmas of controlled optical depths. Such plasmas can possibly be used as intensity standards at other wavelengths in the vacuum ultraviolet by using other gases having strong lines appropriatedly spaced. Similar measurements on the Lyman-beta line support these results. (Author)

AD-418 209 Div. 25
OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
HEAT TRANSFER.
19 Aug 63, 22p.
FTD TT63 452 Unclassified report

Report on Teploperedacha, Energeticheskiy Institut Akademii Nauk SSSR, Izdatel'stvo Akademii Nauk SSSR, Moscow, pp. 22-26, 116-123, 1962.

Descriptors: (*Alkali metals, Heat), (*Pipes, Surface properties), Entropy, Specific heat, Melting, Liquid metals, Boiling, Heat transfer.

Contents: The Entropy and Heat Capacity of Alkali Metals in the Fused State; and The Effect of Certain Surface Properties on the Boiling Crisis.

AD-418 211 Div. 25, 2
OTS price $3.60

Durham U. (Gt. Brit.).
MEASUREMENT OF LOW ELECTRIC FIELDS UNDER UPPER ATMOSPHERE CONDITIONS.
Final technical rept., 1 Oct 59-30 Sep 62,
by J. Alan Chalmers, W. C. A. Hutchinson, P. J. L. Wildman, and M. G. Edwards. Nov 62, 23p.
Contract AF61 052 278
AFCRL 63 236 Unclassified report

Descriptors: (*Electric fields, Measurement), (*Upper atmosphere, Simulation), (*Plasma sheath, Analysis), Temperature, Electrons, Plasma medium, Gas discharges, Probes (Electromagnetic), Charged particles, Satellites (Artificial), Calibration, Space charges, Thermionic emission, Electric currents, Sensitivity, Rockets, Electric potential, Tanks (Containers), Electrolytes, Equations, Ions.

A field-mill has been devised to measure the electric field strength at the surface of a vehicle, in the presence of currents of charged particles. The calibration of the field-mill is described. Probe techniques for the purpose of measurement of electric potentials in ionospheric conditions are discussed. (Author)

AD-418 234 Div. 25, 4, 14, 17
OTS price $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE DIFFUSION OF HYDROGEN AND OTHER LIGHT GASES THROUGH MEMBRANES, POROUS MEDIA, AND THIN PLATES: AN ANNOTATED BIBLIOGRAPHY,
by Charlie M. Pierce. Oct 62, 13p. Rept. no. 6 90 63 31; SB63 26
Unclassified report

Descriptors: (*Hydrogen, Diffusion), (*Gases, Diffusion), (*Diffusion, Gases), (*Bibliographies, Diffusion), Membranes, Porous meterials, Sheets, Abstracts, Rubber, Permeability, Vapors, Films, Plastics, Mathematical analysis, Polymers, Cellulose, Osmotic pressure, Organic materials, Metals, Capillaries, Sorption, Measurement, Foils, Textiles, Solution, Solubility.

The diffusion of light gases through porous and semiporous materials has not been studied to any great degree and, unfortunately, very few references have appeared. This bibliography contains 30 selected references dating from 1932. (Author)

AD-418 272 Div. 25, 30
OTS price $.50

Air Force Materials Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
INTEGRATED INTENSITY STUDY OF SOME 1-OLEFINS (C6-C13) BETWEEN 700 AND 500 cm-1.
Report for Aug 60-June 62,
by N. T. McDevitt and F. W. Behnke. Aug 63, 14p.
Proj. 7360, Task 736005
ASD TDR63 638 Unclassified report

Descriptors: (*Organic compounds, Spectra (IR)), (*Spectra (IR), Organic compounds), (*Band spectrum, Organic compounds), Absorption spectra, Intensity, Frequency, Mathematical analysis, Alkenes, Spectrophotometers.

The integrated intensities of a series of 1-olefins, hexene through tridecene, were measured. In all cases the compounds were studied as pure liquids. The integrated intensities were obtained by direct integration using the Cabana-Sandorfy method. The results are discussed in relation to the instrumental parameters necessary to record true band shapes and intensities. (Author)

AD-418 287 Div. 25
OTS price $10.10

Air Force Cambridge Research Labs., Bedford, Mass.
ELECTROMAGNETIC BOUNDARY WAVES. AN INTRODUCTION.
Research rept.,
by F. J. Zucker. June 63, 119p.
Proj. 5635
AFCRL 63 165 Unclassified report

Descriptors: (*Electromagnetic waves, Theory), Refraction, Excitation, Diffraction, Propagation, Dielectric properties, Circuits, Waveguides, Green's function, Resonance.

The theory of electromagnetic boundary waves is developed from Maxwell's equations, with emphasis on surface and leaky waves. First, a simple case of surface and leaky wave excitation is analyzed. The characteristics of inhomogeneous plane waves are then derived and related to the general properties of boundary waves along plane interfaces. The diverse types of boundary waves arising in waveguiding, refraction, diffraction, and propagation are then displayed. Surface waves on guiding structures, and the radiation mechanism of both surface and leaky waves on finite-length structures, are explored in some detail. (Author)

AD-418 304 Div. 25
OTS price $7.60

Laboratoire Mediterraneen de Recherches Thermodynamiques (France).
STUDY OF THE REFLECTION OF MOLECULES ON SURFACES BY MEANS OF THE REVOLVING DISK OR THE MOLECULAR GUN METHOD.
Final rept.,
by F. Marcel Devienne, J. Souquet, A. Roustan, J. C. Roustan, and G. M. Forestier. July 63, 1v.
Contract AF61 052 646
AFOSR 5324 Unclassified report

Descriptors: (*Molecular beams, Reflection), (*Metal plates, Rotation), Ion sources, Heat exchangers, Cooling, Atomic energy levels, Scattering, Temperature, Aluminum, Tungsten, Helium group gases.

AD-418 305 Div. 25
OTS price $1.10

Stanford Electronics Labs., Stanford U., Calif.
ON THE POWER SCATTERED FROM DENSITY FLUCTUATIONS IN A PLASMA,
by D. R. Moorcroft. June 63, 5p. Scientific rept. nos. 6 and 3; SEL63 066
Contracts AF19 604 7436 and AF19 628 233
AFCRL 63 807 Unclassified report

Descriptors: (*Plasma medium, Incoherent scattering), Radio waves, Power, Electron density, Electrostatics, Ionospheric propagation, Hydrogen, Ions, Electrons, Temperature.

The power spectral density for scattering from density fluctuations in a plasma was numerically integrated to check an approximate analytical expression for the total scattered power. For all-wavelength - Debye-length ratios, the analytical expression decreases monotonically with increasing electron-ion temperature ratio. The numerical results differ significantly from this behavior only for temperature ratios greater than to a maximum for large temperature ratios. The discrepancy is more important for less massive ions and for larger-wavelength - Debye-length ratios. (Author)

AD-418 316 Div. 25
OTS price $1.10

Pennsylvania State U., University Park.
THE USE OF ANOMALOUS DISPERSION FOR DIRECT X-RAY ANALYSES OF NON-CENTRIC CRYSTAL STRUCTURES,
by Ray Pepinsky. 1959, 2p.
Contract AF18 603 35
Unclassified report

Abstract for International Crystallographic Convention, Leningrad, USSR, May 21-27, 1959.

Descriptors: (*Crystal structure, X rays), Determination, Abstracts, Ferroelectric crystals, Crystals, Scattering.

AD-418 327 Div. 25, 2
OTS price $8.60

Aerospace Communications and Controls Div., Radio Corp. of America, Burlington, Mass.
GRAVITATIONAL CONSTANT STUDY.
Final rept.,
by Robert Mark, Joseph Mason, and Morris Neiman.
30 June 63, 1v.
Contract AF19 628 1636, Proj. 8607, Task 860701
AFCRL 63 842 Unclassified report

Descriptors: (*Gravity, Measurement), (*Torque, Instrumentation), Numerical analysis, Sensitivity, Calibration, Uranium.

The theory and design of an apparatus and an experiment for determining the gravitational constant by utilizing gravity gradient measurements was investigated. Comparison with classical methods of determining the gravitational constant indicated sufficient advantage to justify detailed study of the gradient approach. Modifications to the existing Air Force Cambridge Research Laboratories Gradiometer are suggested to facilitate performance of the experiment. The experimental errors inherent in the procedure and apparatus are analyzed. A limiting accuracy of one part in 30,000 is estimated based on a depleted uranium proof mass weighing 835 pounds and on the estimated performance of the modified gradiometer. It is concluded that the gradiometer experiment offers good probability of obtaining a substantial improvement in the accuracy of the gravitational constant, currently about one part in 2000. (Author)

AD-418 338 Div. 25
OTS price $3.60

Army Electronics Research and Development Agency, Fort Monmouth, N. J.
MAXIMUM GAIN FOR FORWARD AND BACKWARD WAVE OPTICAL MASER AMPLIFIERS,
by H. Jacobs, D. A. Holmes, L. Hatkin and F. A. Brand. July 63, 26p.
Task 1A013001A039 08
AELRDL TR2375 Unclassified report

Descriptors: (*Lasers, Ruby), (*Backward-wave amplifiers, Design), Air, Amplitude modulation, Analysis, Attenuation, Oscillation, Power, Equations, Electromagnetic fields, Dielectric properties, Boundary valve problems, Errors, Determinants, Reflection, Propagation, Crystals, Contrast media.

An analysis was made of the mechanism of amplification in a device consisting of three media. The first medium is considered to be air, the second medium to be a crystal having a specific dielectric constant and distributed negative conductivity of constant value, and the third medium air. The equations for power gain in transmission and reflection are derived in a general manner. Following this, the condition on the length of the active region for maximum power gain in both forward and reflected modes of operation is approximated as well as the magnitude of gain. When the development is applied to the ruby optical maser, the length producing maximum gain is found to be the same for both the reflection and transmission type amplifier. Furthermore, as the length of the crystal is increased, oscillations are predicted at a single optimum value of the product of the negative attenuation constant and length. (Author)

AD-418 355 Div. 25, 31
OTS price $9.10

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
ACOUSTIC RADIATION OF A CYLINDRICAL BAR AND AN INFINITE PLATE EXCITED BY THE FIELD OF A SHIP PROPELLER,
by S. Tsakonas, C. Y. Chen and W. R. Jacobs.
July 63, 48p. R888
Contract Nonr26337, Proj. S R009 01 01; DL Proj. LR2367 037
Unclassified report

Descriptors: (*Propellers (Marine), Propeller noise), (*Propeller noise, Cylindrical bodies), (*Flat plate models, Sound), Partial differential equations, Mechanical waves, Mathematical analysis, Integral equations, Series, Velocity, Pressure.

In one instance, an infinitely long elastic beam with circular cross section and in another an infinite elastic plate are immersed in an acoustic fluid parallel to an operating marine propeller. The pressure field generated by the propeller and transmitted and radiated by cylindrical beam or plate is studied by means of Fourier transform techniques. Analytic expressions for the pressure signals due to the scattering and radiating mechanisms are obtained at large distances from the disturbance and a study is made of their dependence on such important parameters as propeller clearance, reduced frequencies, number of blades, propeller loading and geometry as well as the elastic properties of the boundary. Furthermore, closed form expressions of extreme simplicity are developed for the propeller-induced vibratory force on the cylinder and on the plate. Numerical results are obtained on the assumption of constant loading for a 2- 3- and 4-bladed propeller at various distances and different propeller clearances. The calculated sound pressures for realistic values of the parameters indicate that an appreciable sound level is obtained through the mechanism of the elastic boundary reaction to the propeller motion. (Author)

AD-418 360 Div. 25
OTS price $8.10

Service Technique Des Telecommunications, De L'Air (France).
MICROWAVE DETERMINATIONS OF AFTERGLOW TEMPERATURES AND ELECTRON COLLISION PARAMETERS IN NITROGEN AND OXYGEN.
Final technical rept., 1 Jan 58-31 Jan 62,
by A. Gilardini. 31 May 63, 89p.
Contract AF61 052 39
AFCRL 63 358 Unclassified report

Descriptors: (*Glow discharges, Electron bombardment), (*Temperature, Glow discharges), Microwaves, Nitrogen, Oxygen, Electromagnetic waves, Energy, Plasma physics, Electrical conductance, Waveguide.

The work on the microwave determination of afterglow radiation temperatures, electron collision frequencies and fractional energy losses per collision in nitrogen and in oxygen is described. These determinations are based on measurements of the plasma conductivity and noise emission in a waveguide and on the variations of these quantities when additional microwave signals, capable of increasing the electron energies, are sent through the plasma. A transverse static magnetic field, perpendicular to the electric field in the waveguide, is also used in some experiments in order to increase plasma conductivity and noise emissivity. The method, the computation formulas and the experimental techniques are discussed in detail. The experiments performed and the results are compared with those of other authors; in most cases the agreement is quite satisfactory. (Author)

26. PRODUCTION AND MANAGEMENT

AD-418 106 Div. 26, 17
OTS price $2.00

Aluminum Co. of America, Pittsburgh, Pa.
INVESTIGATION TOWARD OBTAINING SIGNIFICANTLY HIGHER MECHANICAL PROPERTIES OF AS-WELDED JOINTS IN HIGH-STRENGTH, HEAT TREATABLE ALUMINUM ALLOYS,
Phase rept. no. 2,
by F. R. Collins. 20 Sep 63, 65p.
Contract DA36 034ORD3237A, Proj. 1-H-0-24401-A-111-01
Unclassified report

Descriptors: (*Aluminum alloys, Welds), (*Welds, Aluminum alloys), Tensile properties, Corrosion, Tests, Nondestructive testing, Welding, Cold working, Heat treatment, Stresses, Arc welding, Fracture (Mechanics), Ductility, Aging (Materials), Experimental data, Zinc alloys, Magnesium alloys, Copper alloys, Manganese alloys, Microstructure.

This report describes the second phase of an investigation to improve welds in high strength aluminum alloys such as 7075 and 7178. Direct current, straight polarity, helium shielded tungsten arc automatic welding was preferred for most consistent results, although highest individual weld strengths were achieved with carefully controlled consumable electrode short arc technique. High travel speeds, with TIG welding, decreased weld strength because of small hot-short cracks. Cold working of welds before aging often caused cracks and had no beneficial effect on strength. Locally heat treating welds with a low power arc before aging increased ductility in both tensile and bulge tests. Strength was about equivalent to non-heated welds. Base metal properties determined after short time exposure to high temperatures were used to predict joint designs for local heat treatments. (Author)

AD-418 174 Div. 26, 12, 15
OTS price $3.60

Coordinated Science Lab., U. of Illinois, Urbana.
UPPER BOUNDS FOR THE MEAN LIFE OF SELF-REPAIRING SYSTEMS,
by Jaan Kruus. July 63, 34p. Rept. no. R172
Contract DA36 039TR US AMC02208, Proj. 3A99 25 004
Unclassified report

Descriptors: (*Space maintenance, Machines), (*Reliability, Optimization), Mathematical models, Life expectancy, Statistical distributions, Statistical processes, Probability, Maintenance.

Upper bounds are obtained for the mean life of a self-repairing system consisting of several identical machines, spare parts, and the necessary connecting and wiring mechanism. No detailed knowledge is assumed about the machines, except that each is by itself capable of performing the function required of the system, and that three of these machines may be interconnected to diagnose and direct the repair of a suspected

fault in a fourth machine. The time required for diagnosis and repair is a random variable. System mean life is obtained by selecting random machine lifetimes for a system simulated on an electronic computer. The switching mechanism is assumed to function without failures. The computation time is of the order of .2 milliseconds for each time a machine is put into operation. To check the results obtained by simulation, exact analysis is performed for a simplified system. An improvement by a factor greater than 100 in system mean life over the mean life of a machine is attainable if the repair and conditioning times are of the order of 1/200 of the mean life of a machine and a sufficient supply of spare parts is available. The systems need about 20 machines for efficient operation. System mean life is found to be quite sensitive to changes in the stress factor of spare machines. (Author)

AD-418 353 Div. 26, 14, 17
OTS price $1.10

Foster, John J, Mfg. Co., Costa Mesa, Calif.
(No title).
Final rept.,
by L. F. Elliott. 1 Apr 63, 7p.
Contract Noas58 659C
Unclassified report

Descriptors: (*Stainless steel, Honeycomb cores), (*Honeycomb cores, Sandwich panels), (*Sandwich panels, Stainless steel), (*Resistance welding, Sandwich panels), Electrodes, Cooling, Manufacturing methods, Flanges, Welding, Quality control, Refractory materials, Sheets, Machine tools, Processing.

This report includes the progress and achievements made in the manufacturing research and development of STRESSKIN, an all resistance welded stainless steel honeycomb sandwich panel. The improvements reported are in relation to composite panel prototype equipment developed. This report outlines the progress made in improving prototype welding equipment and welding techniques. (Author)

27. PROPULSION SYSTEMS

AD-418 136 Div. 27, 26
OTS price $15.00

Aerojet-General Corp., Downey, Calif.
EXPLOSIVE FORMING OF CLOSURES FOR LARGE SOLID PROPELLANT MOTOR CASES.
Final rept., June 62-July 63,
by A. W. Hall, E. K. Henriksen and I. Lieberman.
Aug 63, 217p. Rept. no. 0665 01 01FP
Contract AF04 611 8395
Unclassified report

Descriptors: (*Rocket motors (Solid propellant), Rocket cases), (*Rocket cases, Rocket closure cups), (*Rocket closure cups, Rocket motors (Solid propellants)), (*Explosive forming, Rocket closure cups), Dies, Material forming, Steel, Nickel alloys, Manufacturing methods, Welds, Thickness, Strain (Mechanics), Tests, Measurement, Cold working, Mechanical properties, Ice, Shock waves, Industrial equipment.

The application of ice die and free-forming techniques to produce large closures by the explosive forming process is described. Problem areas associated with steel procurement, blank processing, and die fabrication are also presented in detail with recommended solutions where applicable. The successful use of welded blanks in conjunction with explosive forming is described. The behavior of 18% nickel maraging steel subjected to high strain rates is evaluated. The application of explosive welding techniques to the 18% nickel maraging steel is discussed, and some of the effects on structure and preliminary evaluations of weld strength are presented. Problems associated with the extension of the work performed in this program to the 160-inch diameter size are described in detail and fabrication procedures for use in the 160-inch diameter chamber are detailed. (Author)

AD-418 182 Div. 27, 20
OTS price $4.60

Columbia U., New York.
MAGNETOHYDRODYNAMIC SPECIES SEPARATION IN A GASEOUS NUCLEAR ROCKET,
by R. A. Gross and K. O. Kessey. July 63, 43p.
Rept. no. 4
Grant AF AFOSR48 63
AFOSR 5222 Unclassified report

Descriptors: (*Magnetohydrodynamics, Rocket motors), (*Nuclear reactors, Magnetohydrodynamics), (*Nuclear propulsion, Heat transfer), Reactor cores, Separation, Uranium, Rocket motors (Liquid propellant), Hydrogen, Electrostatic fields, Radioactive isotopes.

The possibility of steady flow separation of U-235 from hydrogen by magnetohydrodynamically spinning the fluid in a cylindrical vortex is treated. A gaseous nuclear rocket configuration is described and its model analyzed. The hydromagnetic equations are solved for the velocity distribution, pressure field, concentration of uranium and hydrogen, electrical power required, and dissipation rates as a function of Hartmann number, and radial Reynold's number. Results of gaseous reactor criticality calculations are given for both unshielded and shielded configurations. Some properties of a hydrogen plasma are presented. Potential rocket performance is given and some further technical problems discussed. The technology involved in this rocket concept is complex and little experience is available. However, the results of this analysis are encouraging and the means of attaining a large thrust rocket with very high specific impulse are seen. (Author)

AD-418 226 Div. 27, 20
OTS price $3.60

Kelsey-Hayes Co., Romulus, Mich.
THE DESIGN AND EVALUATION OF PERFORATED ION EMITTERS.
Final rept. May 62-Aug 63,
by E. N. Petrick and J. J. Krauss. 15 Sep 63, 32p.
Contract AF33 657 8638, Proj. 3141, Task 314102
ASD TDR63 750 Unclassified report

Descriptors: (*Ion engines, Ion sources), (*Ion sources, Cesium), (*Cesium, Ionization), Electric propulsion, Manufacturing methods, Electron beams, Chemical milling, Sheets, Reliability, Feasibility studies, Porous metals, Gas flow, Nitrogen, Tungsten, Molybdenum.

The feasibility of utilizing emitters of perforated solid sheet rather than a sintered powder structure was investigated with the objective of increasing the reliability and durability of ion engines. Various techniques for drilling micron-size holes in refractory metals were explored. Two of these processes, electron beam

drilling and chemical photo-etching, were used to provide test emitters with hole sizes in the 10-micron range. An electron beam drilled emitter was Cs flow tested for 83 hours and exhibited, within experimental limits, no discernible change in hole size or flow conductance. In separate tests correlation was made of theoretical and measured flow rates of N and Cs through the emitters. It was determined that the measured Cs flow rate exceeded the theoretically calculable value based on available surface diffusion formulae. (Author)

AD-418 330 Div. 27, 12
OTS price $6.60

Aerojet-General Corp., Sacramento, Calif.
ACOUSTIC ANALYSIS OF FILAMENT-WOUND POLARIS CHAMBERS.
Final rept.,
by A. T. Green, C. S. Lockman and H. K. Haines.
16 Sep 63, 1v. Rept. no. 0672 01F
Contract NOw62 1007c FBM
Unclassified report

Descriptors: (*Rocket motors (Solid propellant), Rocket cases), (*Rocket cases, Filament wound construction), Acoustics, Analysis, Hydrostatic pressure, Tests, Velocity, Sound, Propagation, Instrumentation, Data, Recording systems, Booster motors, Guided missiles (Underwater-to-surface), Non-destructive testing, Acoustic properties, Strain (Mechanics), Deflection, Acceleration, Glass textiles.

An acoustical analysis was made of Polaris filament-wound chambers. The structural dynamic energy emanating from chambers during hydrostatic pressure tests was recorded by accelerometers and analyzed. Velocity-of-sound measurements were made to determine parameters affecting wave propagation through composite structures. The analysis of recorded data has provided a method for establishing the structural integrity of a chamber after it has been hydrostatically-tested to proof pressure. This verification may be made at lower proof pressures than those currently used. (Author)

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-417 998 Div. 28
OTS price $1.60

Colorado U., Boulder.
CONCEPTUAL SYSTEMS AND DELINQUENCY,
by Edward H. Juers. 1963, 13p. Technical rept. no. 6
Contract Nonr114707
Unclassified report

Descriptors: (*Personality, Criminology), (*Criminology, Personality), Motivation, Attitudes, Behavior, Psychometrics, Theory, Training.

From an intensive examination of 100 randomly selected files of individuals who had been committed to the State Training School for Boys, Redwing, Minnesota during the period of 1954-57 subjects were classified as representing one of the four principal systems or modes of conceptual functioning posited by Harvey, Hunt and Schroder (1961). It was found that System 2 individuals, those with the more negative attitudes toward authority and its representatives, comprised almost 50% of the boys that had been committed only once while they comprised 65% of the recidivists. Possible changes in the training programs for improved rehabilitation of System 2 individuals was briefly suggested. (Author)

AD-418 190 Div. 28, 8
OTS price $5.60

University of Southern Calif., Los Angeles.
THE PSYCHOLOGICAL DIMENSIONALITY OF BASIC ELECTRONIC CIRCUITS: I. THE STABILITY OF THE SCALING TECHNIQUES,
by Joseph W. Rigney, Robert Fromer, and C. Henry DeBow. July 63, 47p. Technical rept. no. 38
Contract Nonr22822, Proj. NR153 093
Unclassified report

Descriptors: (*Electronic equipment, Maintenance), (*Circuits, Identification), (*Test construction (Psychology), Reliability).

This is the first of a series of reports concerned with the use of multidimensional scaling in identifying electronic circuit characteristics which make their functions difficult for electronics technicians to understand. Thirteen basic electronic circuits were analyzed. Scale values for the 78 possible circuit-pairs were derived by the multidimensional method of successive intervals. There were converted to interstimulus distances, which were analyzed for minimum dimensionality by three current methods of multidimensional scaling. Six dimensions were extracted. The first three of these accounted for most of the variance in the interstimulus space. This report presents data on the reliability of these multidimensional procedures. Estimates of reliability were computed for the successive steps in the method; including intrasubject stabilities across replications, distance scale stabilities, and coefficients of congruence for final dimensions across replications, groups, and methods. (Author)

AD-418 212 Div. 28
OTS price $2.60

Duke U., Durham, N. C.
A THEORY OF STATUS EQUILIBRATION,
by James C. Kimberly. 1963, 26p. Technical rept. no. 6
Contract Nonr118111, Proj. NR179 740
Unclassified report

Descriptors: (*Group dynamics, Behavior), (*Sociometrics), Theory, Measurement.

A theory of status equilibration is formulated. The existence of status inconsistencies is assumed, and attention is focused on types of status inconsistencies, the social psychology of reactions to these types of status inconsistencies, and modes of status equilibration. Because ability tends to be relatively unchangeable, it is held that status equilibration involves primarily changes in functions. Two modes of status equilibration are defined: mobility with respect to function and reallocation of functions. The former mode of status equilibration involves the individual moving from one existent set of functions to another. The latter mode of status equilibration involves the individual effecting reallocation of functions among the members of the social system which tend to equilibrate his status. The conditions under which each of these modes of status equilibration tends to occur are specified. It is held that in the absence of opportunities for status equilibration, status inconsistency decreases the individual's motivation to participate in the social system. (Author)

AD-418 235 Div. 28
OTS price $12.00

Educational Testing Service, Princeton, N. J.
LEARNING PARAMETERS AND HUMAN ABILITIES.
Technical rept.,
by Roger B. Allison, Jr. May 60, 1v.
Contracts Nonr69400 and Nonr185815, Proj. NR151-113 and NR150 088
Unclassified report

Doctoral thesis.

Descriptors: (*Learning, Measurement), (*Psychometrics, Aptitude tests), (*Aptitude tests, Factor analysis), (*Memory, Effectiveness), Factor analysis, Test construction (Psychology).

The purpose of this study was to explore the interrelationships among learning parameters and also the interrelationships between learning parameters and measures of human abilities. Two factor analytic techniques were employed to organize the interrelationships of the variables into more meaningful dimensions based upon common factor variances. The first technique was a conventional multiple-factor analysis of the intercorrelation matrix for the 28 learning parameters. The second factor analytic technique was Tucker's inter-battery method which determined the number of factors in common between the learning parameters and the reference measures. From the specific findings, two general conclusions were drawn from the project. First, the factorial organization of the learning parameters was multidimensional. And second, measures of learning and measures of aptitude and achievement, which have generally been treated experimentally as separate entities, have factors in common with each other. Thus, the ability to apply knowledge and the acquisition of knowledge have highly similar or identical properties. (Author)

AD-418 271 Div. 28
OTS price $1.25

Flight Dynamics Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
THE STATISTICAL PROPERTIES OF SIGNALS AND MEASUREMENTS OF SIMPLE MANUAL CONTROL SYSTEMS,
by Jerome I. Elkind and D. Lucille Darley.
July 63, 40p. Rept. no. 1009
Contract AF33 657 7586, Proj. 8219, Task 821905
ASD TDR63 85 Unclassified report

Descriptors: (*Human engineering, Control systems), (*Signals, Statistical analysis), (*Statistical functions, Statistical distributions), (*Operators (Personnel), Reaction (Psychology), (*Control systems, Design), (*Display systems), Tracking, Errors.

The distribution functions of the amplitudes of the signals flowing in a simple compensatory manual control system and of the transfer functions and power spectra used to describe the characteristics of the system were measured when the system was excited by a variety of different gaussian input signals. For very low and very high bandwidth signals there is some indication that the error and remnant (the part of system response not linearly correlated with the input) signals may not be normal. The open-loop transfer function for the human operator expressed in terms of log magnitude and phase was found to be approximately normal. The error and remnant power spectra were found to be distributed approximately as X2. (Author)

AD-418 342 Div. 28
OTS price $2.60

Miami U., Coral Gables, Fla.
PERSONALITY CORRELATES OF TWO KINDS OF CONFORMING BEHAVIOR,
by John M. McDavid. Aug 63, 20p. Technical rept. no. 5
Contract Nonr84022, Proj. NR177 303
Unclassified report

Descriptors: (*Personality, Measurement), (*Behavior, Measurement), (*Adjustment (Psychology), Motivation), (*Psychometrics, Personality), Perception, Correlation techniques, Motivation.

A correlational analysis of scores on the Edwards Personal Preference Schedule, the Gordon Survey of Interpersonal Values, the Guilford-Zimmerman Temperament Survey, and the Leary Interpersonal Adjective Check List, with conforming behavior in a Crutchfield situation on two kinds of judgmental tasks (unambiguous and easily soluble, versus maximally ambiguous and insoluble) revealed differential patterns of personality correlates with conformity on each kind of task. Findings support the notion that conformity in well-defined situations (in which conformity contradicts a clear external standard) is associated with ''agreement-seeking,'' whereas conformity in ambiguous situations (in which there is no clear external standard) is associated with both agreement-seeking and ''information-seeking.'' (Author)

AD-418 349 Div. 28
OTS price $9.60

Electronic Systems Div., Air Force Systems Command, Bedford, Mass.
BIBLIOGRAPHY OF HUMAN FACTORS RESEARCH WITH ABSTRACTS, 1954 THROUGH 1962,
by J. P. Gonon. Aug 63, 109p.
ESD TDR63 603 Unclassified report

Descriptors: (*Human engineering, Bibliography), (*Bibliography, Human engineering), (*Command and control systems), (*Speech, Communication systems), Test equipment, Test methods, Learning, Intelligibility, Hearing, Psychoacoustics, Vision, Training, Experimental data, Statistical analysis, Language.

This bibliography contains unclassified abstracts of selected Technical Documentary Reports issued by the Decision Sciences Laboratory, Electronics System Division, Air Force Systems Command, during 1954 through 1962. The major areas comprising the Laboratory's mission are the performance of behavioral science research, development, and testing to advance command and control system technology, and the implementation of research findings to improve the design and performance of Command and Control Systems. The bibliography contains three indices, cross-referencing the reports by author, by organization, and by specialized categories: (1) Statistics, Measurements and Methods, (2) Psychophysical Research (Audition and Vision), (3) Perception and Cognition, (4) Learning and Training, (5) Group Processes, (6) Psycholinguistics, (7) Systems Research (Design and Analysis, Human Engineering, Personnel, Test and Evaluation, Training), (8) Bibliographies, Handbooks, and Indexes, and (9) Equipment. (Author)

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-417 934 Div. 29
OTS price $1.10

Spacelabs Inc., Van Nuys, Calif.
DYNAMIC MEASUREMENTS OF PROTECTIVE MASKS.
Monthly progress rept. no. 2, 1-31 Aug 63.
31 Aug 63, 2p.
Contract DA18 108AMC228A
Unclassified report

Descriptors: (*Protective masks, Measuring devices (Electrical and electronic), (*Radio receivers, Tests), (*Radio transmitters, Tests), Test equipment (Electronics).

AD-418 389 Div. 29
OTS price $1.00

Naval Supply Research and Development Facility, Bayonne, N. J.
EVALUATION OF PORK LOIN, FROZEN, STRING-TIED, PORK LOIN, FROZEN, STRINGLESS-IN CASING AND PORK CHOPS, FROZEN, BONED,
by H. R. Ignall. Dec 62, 24p.
Unclassified report

Descriptors: (*Food, Acceptability), Pork, Meat, Navy, Frozen foods, Tests, Costs, Analysis.

Laboratory and operational tests were conducted on three new prefabricated meat products: (1) Pork Loin, Frozen, String-Tied; (2) Pork Loin, Frozen, Stringless-in-Casing; and (3) Pork Chops, Frozen, Boned - to determine their suitability for Navy use. All three test products were found superior to the currently authorized bladeless and partially-boned loins in their average edible cooked yields, appearance, ease of preparation and portion control characteristics. While both the string-tied and casing-type loins were found suitable for preparation either as roast pork or as pork chops, the string-tied was preferred. The reasons for this preference were: greater ease in removing the strings as compared to removing the casing from the stringless-in-casing product, and the slightly lower losses incurred in preparation. Although excellent in yield and portion control, the pork chops were considered of limited utility because they were a single use product, and because they are space-consuming as packed at present. (Author)

AD-418 390 Div. 29, 28
OTS price $1.75

Army Natick Labs., Mass.
COMFORT FACTORS IN LEATHER FOOTWEAR,
by Ludwig Seligsberger. Aug 63, 57p.
ANL Footwear and Leather Series Rept. no. 17
Unclassified report

Descriptors: (*Shoes, Human engineering), (*Human engineering, Shoes), (*Legs, Physiology), (*Leather, Effectiveness), (*Stress (Physiology, Reduction), (*Relaxation (Physiology), Perspiration, Blood circulation, Body weight, Body temperature, Thermal conductivity.

Comfort in leather footwear is discussed as the result of physiological and environmental factors that influence its wearability, rather than as a matter of good fit, which is an obvious prerequisite. Ranking low in importance for comfort are such properties as thermal expansion, color, air permeability, and the heat of wetting. Properties that depend largely on the tanning process used, such as stiffness and dimensional changes, deserve careful attention but do not usually create serious comfort problems. The most important combination of properties is one that copes both with foot perspiration and with the danger of ''getting wet feet''. In dealing with foot perspiration, the water vaporpermeability and the capacity of leather to absorb liquid and vaporized water come into play. To avoid ''wet feet'', water resistant leathers have been developed. The report reviews methods of evaluating these properties in the leather that goes into footwear and in the shoes and boots themselves. It discusses comfort factors of uppers, insoles, and outsoles; the water balance around the foot; the distribution of body weight; and the weight of footwear. The report also discusses the difficult topic of the subjective evaluation of footwear by means of wearer questionnaires and interviews. (Author)

AD-418 393 Div. 29, 14
OTS price $1.10

Walter Reed Army Inst. of Research, Washington, D. C.
SUMMARY OF FIELD TEST RESULTS VINYL COSMETIC GLOVES,
by James Eaton, Jr. Aug 63, 8p.
Proj. 3A012501A802 03
WRAIR TR6312 Unclassified report

Descriptors: (*Polyvinyl chloride, Gloves), (*Gloves, Polyvinyl chloride), Manufacturing methods, Physical properties, Tests, Polymers, Processing, Mechanical properties.

From the results of the field tests and the laboratory determinations of physical properties it becomes clear that the three gloves studied here are superior over-all to the currently available commercial gloves and are as good as or better than any of the dilaminar gloves tested. Since the dilaminar gloves involve additional steps in processing and would therefore be more costly a monolaminar glove with much the same properties is preferred. The choice of a glove material for further developmental work shall be based upon the following criteria: (1) Physical properties of the vinyl material, most importantly flexibility, extensibility (modulus) and stain resistance; (2) Ease of processing the plastisol into a cosmetic glove; and (3) Availability of raw materials. (Author)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-417 853 Div. 30, 2
OTS price $6.60

National Bureau of Standards, Washington, D. C.
THE EFFECT OF EVAPORATION CONDITIONS ON THE HUMIDITY SENSITIVITY AND RESPONSE OF POTASSIUM METAPHOSPHATE FILMS,
by F. E. Jones, A. Wexler, S. B. Garfinkel and R. A. MacQuarrie. Dec 57, 1v.
Proj. 0602 20 3510
NBS Rept. no. 5672 Unclassified report

Descriptors: (*Hygrometers, Materials), (*Films, Vapor plating), (*Meteorological instruments, Hygrometers), (*Potassium compounds, Phosphates), Humidity, Evaporation, Laboratory equipment, Calibration, Hysteresis, Low-pressure research, Thickness, Sensitivity, Test methods.

This report describes results of studies of the properties of vacuum deposited potassium metaphosphate films, particularly the electrical resistance of such films and the results of efforts to reduce the resistance of potassium metaphosphate hygrometer elements. Work is continuing on potassium metaphosphate films as well as on other evaporated material for obtaining improved performance as humidity sensors. (Author)

AD-417 904 Div. 30, 1
OTS price $1.10

Fenwal, Inc., Ashland, Mass.
EVALUATION OF LIGHTWEIGHT FIRE EXTINGUISHING SYSTEM UNDER SIMULATED FLIGHT CONDITIONS.
Interim rept. no. 2, 3 June-2 Aug 63,
by C. J. Cole. 5 Aug 63, 3p.
Contract N600 19 59752
Unclassified report

Descriptors: (*Aircraft fires, Test facilities), Construction, Instrumentation, Design, Turbojet engines, Fire extinguishers, Test methods.

The test apparatus has been built, delivered, and installed at the Fenwal Test Facility. Electrical service for the Apparatus is being installed. Preliminary design work has been done on the fuel dispersion apparatus, wet plumbing configuration, and instrumentation layout. (Author)

AD-418 175 Div. 30
OTS price $1.60

Coordinated Science Lab., U. of Illinois, Urbana.
A NEW APPROACH TO THE SENSITIVITY PROBLEM IN MULTIVARIABLE FEEDBACK SYSTEM DESIGN,
by J. B. Cruz Jr. and W. R. Perkins. Aug 63, 12p. Rept. no. R177
Contract DA36 039TR US AMC02208E, Proj. 3A99 25 004
Unclassified report

Descriptors: (*Adaptive control systems, Design), (*Feedback, Sensitivity), Instrumentation, Equations, Inequalities, Analysis, Synthesis, Functions, Integral transforms, Performance (Engineering), Stability.

A new point of view for the parameter variation problem in linear multivariable systems is proposed. The output deviations due to parameter variations for an open loop realization are related by a sensitivity matrix to the output deviations due to parameter variations for a closed loop (feedback) realization. By means of a performance index involving this sensitivity matrix, conditions are obtained for insuring that the feedback realization is less affected by parameter variations than an open loop realization having the same nominal transfer characteristics. A procedure based on this new sensitivity formulation is given for designing a multivariable feedback system. (Author)

AD-418 176 Div. 30
OTS price $6.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
INFORMATION PROCESSING RELEVANT TO MILITARY COMMAND: SURVEY, RECOMMENDATIONS AND BIBLIOGRAPHY. VOLUME II (BIBLIOGRAPHY APPENDIX).
Final rept.,
by A. E. Murray and H. R. Leland. Feb 63, 1v.
Contract AF19 628 1625
ESD TDR63 349 Unclassified report

Descriptors: (*Artificial intelligence, Bibliographies), (*Pattern recognition, Bibliographies), (*Decision making, Bibliographies), (*Command and control systems, Bibliographies), (*Bibliographies).

The second volume of the final reports on Contract No. AF 19(628)-1625 consists of a set of bibliography cards referencing the most recent works in artificial intelligence, pattern recognition, and decision making, not likely to be found in any previously published bibliographies. It also contains a few entries into the current military literature on command and control, as well as a few entries into the older more classic works in artificial intelligence which are used as references for subject area review sections of volume one, and some of which might, of course, be found in recently published older bibliographies. This Volume II is printed on light card stock so that the user may cut the pages to produce 3 x 5 in. cards. Volume I contains the main body of the report and Appendix A and is bound separately. (Author)

AD-418 225 Div. 30, 17
OTS price $1.00

Air Force Materials Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
AN APPARATUS FOR DIRECT AND DIFFERENTIAL THERMAL ANALYSIS AT TEMPERATURES UP TO 1500 DEGREES C.
Report for Dec 59-Dec 62,
by Donald J. Evans and Karl Strnat. July 63, 26p.
Proj. 7371, Task 737102
ASD TDR63 504 Unclassified report

Descriptors: (*Recording systems, Phase studies), (*Phase studies, Alloys), Laboratory equipment, Laboratory furnaces, Copper alloys, Aluminum alloys, Transformations, Iron, Titanium, Cooling, Eutectics, Transformers, Electric potential, Platinum, High-temperature research, Tin, Zinc, Aluminum, Silver alloys, Nickel, Calibration, Yttrium, Experimental data.

A recording apparatus suitable for thermal and differential thermal analysis was developed. It can be used to obtain data for phase diagram investigations on small samples of rare metals and their alloys at temperatures up to 1500 C. The thermal analysis apparatus consists of a platinum wound resistance furnace with protective atmosphere provisions and a Pt/Pt + 13% Rh thermocouple as sensor which feeds a one mV strip chart recorder. A bucking potentiometer used in series with the thermocouple permits a temperature resolution of better than 0.5 C. For differential thermal analysis, an additional 100 microvolt strip chart recorder is used. The heating or cooling rate can be varied between 0.5 C/min and approximately 15 C/minute. The thermal analysis apparatus was calibrated at several fixed points and has an overall accuracy of ±1.5 C. (Author)

Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-418 240 Div. 30, 2
OTS price $5.60

Aeronutronic, Newport Beach, Calif.
CIRCUMLUNAR TRAJECTORY PROGRAM (UNIFIED ENCKE PROGRAM),
by Joanne B. Kloepfer. Aug 63, 52p. Pub. no. U2037
Contract AF19 628 562
ESD TDR63 122 Unclassified report

Descriptors: (*Circumlunar trajectories, Programming (Computers)), (*Elliptical orbit trajectories, Programming (Computers))

The computer program described herein generates ephemerides for geocentric elliptical orbits of moderate eccentricities to hyperbolic eccentricities and corrects the parameters describing the orbit on the basis of observed positions and range rates. The program is written for the Philco 2000 computer in symbolic (TAC) language. Formats, flow diagrams and operating instructions are given. (Author)

AD-418 264 Div. 30
OTS price $1.10

Educational Testing Service, Princeton, N. J.
AN IBM 650 PROGRAM FOR A COMPLETE PAIRED COMPARISONS SCHEDULE (PARCOPLET-2-21),
by Harold Gulliksen. May 60, 3p.
Contract Nonr185815, Proj. NR150 088
Unclassified report

Descriptors: (*Programming (Computers), Correlation techniques), (*Correlation techniques, Computers), Curve fitting, Data, Theory, Digital computers.

The method of paired comparisons and the law of comparative judgment provides a scaling method with accurate checks on the goodness of fit of the data to the theory. An IBM 650 program has been prepared that will handle a complete paired comparison schedule for any number of objects up to and including 21. It is also possible to append and analyze an 'absolute judgment' set of data in which the subject classifies the stimuli into two categories as 'positive or negative,' 'like or dislike.' A checking program has also been prepared to insure that the data cards are in proper form. (Author)

AD-418 282 Div. 30, 16
OTS price $4.60

6570th Aerospace Medical Research Labs., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
BIBLIOGRAPHY OF RESEARCH REPORTS AND PUBLICATIONS ISSUED BY THE BIODYNAMICS AND BIONICS DIVISION.
June 63, 50p.
Unclassified report

Descriptors: (*Bibliographies, Bionics), (*Bionics, Bibliographies), Dynamics, Physiology, Noise, Instrumentation, Control, Hearing, Ear, Speech, Psychology, Vibrations, Shock (Mechanics).

AD-418 321 Div. 30, 32
OTS price $9.10

Princeton U., N. J.
COMPUTER PROGRAMS FOR SPECTRAL ANALYSIS OF ECONOMIC TIME SERIES. ECONOMETRIC RESEARCH PROGRAM,
by Herman F. Karreman. 15 July 63, 100p.
Contracts Nonr185816 and NSFGS30
Unclassified report

Descriptors: (*Computers, Economics), (*Economics, Analysis), Series, Correlation techniques, Memory, Language, Programming (Computers).

Computer programs for spectral analysis of economic time series are presented in this Research Memorandum. There are essentially three programs. The first program computes power spectra of an arbitrary number of series. The second program computes power spectra of sets of up to fourteen series and cross spectra of every combination of two series in the set. The third program computes, in addition to the power- and cross-spectra, the multiple and partial correlation of these spectra of sets of up to six series. Of each of these three programs, there is a Tukey-Hanning and a Parzen-version; both versions are presented here. The programs are written in the Fortran-language for a computer of a little over thirty-two-thousand memory-locations. In the power- and cross-spectra programs one to two thousand locations have been saved to enable the inclusion of a subroutine that will instruct the computer to plot the results. In the multiple and partial correlation subroutine of the third program use has been made of the facility to perform complex-arithmetic operations on the IBM 7090. However, a version of this subroutine which uses only ordinary-arithmetic operations is given in the Appendix. The Tukey-Hanning version of each program is fully described and printed in extenso. (Author)

AD-418 358 Div. 30, 16
OTS price $4.60

Little, Arthur D, Inc., San Francisco, Calif.
DEVELOPMENT OF EXPENDABLE LINER CENTRIFUGE AND SOLUTION FLOW CONTROL SYSTEM FOR GLYCEROLIZATION AND DEGLYCEROLIZATION OF RED BLOOD CELLS.
Final rept., 16 Mar 61-31 Aug 63.
Aug 63, 1v. Rept. no. C63681
Contract Nonr3414 00, Proj. NR105262 and ARPA Order 30562
Unclassified report

Descriptors: (*Centrifuges, Design), (*Blood, Preservation), (*Laboratory equipment, Design), Tests, Blood cells, Erythrocytes, Blood plasma, Storage, Effectiveness.

The object of this work was to learn how to design a practical system for long-term preservation of blood using a process consisting of separation of plasma from red cells, glycerolization of red cells, storage of plasma and glycerolized red cells separately at -80 C until needed, thawing, deglycerolizing the red cells and resuspending them. This process has been under clinical trial for several years using manually operated research equipment, and it is desired to reduce greatly the amount and level of technician skill needed to use the process on a large scale. Development of a system which incorporated use of an expendable centrifuge liner, a glycerolization and deglycerolization kit, and automation of the glycerolization and deglycerolization cycles, was the approach used to minimize use of skilled operating technician attention. The performance of the new system was brought to a level at which the biochemical assays compared very favorably with results obtained with the equipment and procedures used on clinical trial during recent years. Operational

feasibility of the system was demonstrated and the practicability of achieving minimal dependence on skilled operating technicians appears to be well within reach. (Author)

AD-418 364 Div. 30
OTS price $3.60

Wolf Research and Development Corp., West Concord, Mass.
AN ON-LINE SUB-PROGRAM FOR THE DETERMINATION OF EIGENVALUES AND EIGENVECTORS WITH GRAPHIC CONVERGENCE MONITORING FEATURES,
by C. M. Walter, Richard Gagan, Janet Seltzer and Marilyn Wisowaty. 30 Sep 63, 28p. Scientific rept. no. 2
Contract AF19 628 1614, Proj. 4648, Task 464805
AFCRL 63 365 Unclassified report

Descriptors: (*Programming (Computers), Analysis), (*Data processing systems, Matrix algebra), Errors, Transformations (Mathematics), Tables, Sequences, Magnetic tape.

The sub-program described has been prepared for on-line use with the computing equipment of the Experimental Dynamic Processor, DX-1, in analytical studies of systems behavior. The method and implementation for the determination of eigenvalues and eigenvectors are described, followed by a description of the on-line sub-program and an example of its use. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-418 382 Div. 31, 1
OTS price $2.60

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
ANALYSIS OF STABILIZATION OF OPTICAL LANDING SYSTEM AGAINST SHIP ROLL AND PITCH - ''LINE STABILIZED'' VERSION,
by R. B. Quinn. Jan 63, 24p.
NAVWEPS Rept. no. R5 63 2
Unclassified report

Descriptors: (*Carrier landings, Optical equipment), (*Optical equipment, Carrier landings), Stabilization, Navigational aids, Roll, Pitch (Motion), Motion, Stabilization systems, Aircraft carriers, Glide path systems, Aircraft, Mathematical analysis.

The 'line-stabilized' optical landing system for carrier use was studied to determine how stabilization against ship pitch and roll might be accomplished, and to consider how effective such stabilization might be compared to the previously studied 'point-stabilization'. It is shown that the optical glide slope can be line-stabilized by rotating the Fresnel lens assembly about tilt and roll axes in amounts related to ship pitch and roll through four simple, constant ratios which can be calculated from the installation data. It is shown also that for an aircraft which is at one side or the other of the intended glide path the meatball is not perfectly stabilized, and the meatball 'bounce' is comparable to that in a point-stabilized system. Under good conditions this bounce should not be troublesome in either system. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-418 075 Div. 32
OTS price $1.10

California Forest and Range Experiment Station, Berkeley.
A STUDY OF MASS FIRES AND CONFLAGRATIONS,
by Craig C. Chandler. 1963, 7p.
PSW N22 Unclassified report

Descriptors: (*Reviews, Fires), (*Fires, Reviews), (*Forest fires, Reviews), Burning rate, Fire safety.

A review of the literature pertaining to fire spread is presented. Reports of 1,621 large wildland fires and 254 urban conflagrations ranging from the Great Chicago Fire of 1871 to the Coal Pier Fire of 1961 were analyzed. More than 30 rural and city fire chiefs experienced in fighting conflagration fires were interviewed and mass-fire experts in Canada, Australia, and Japan were consulted. (Author)

AD-418 152 Div. 32, 30
OTS price $11.50

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
INFORMATION PROCESSING RELEVANT TO MILITARY COMMAND: SURVEY, RECOMMENDATIONS AND BIBLIOGRAPHY. Final rept.,
by A. E. Murray and H. R. Leland. Feb 63, 155p.
Contract AF19 628 1625
ESD TDR63 349 Unclassified report

Descriptors: (*Documentation, Military requirements), (*Data processing systems, Military requirements), (*Data, Collecting methods), (*Command and control systems, Information retrieval), (*Decision making, Command and control systems), Artificial intelligence, Pattern recognition, Data storage systems, Programming (Computers), Theory.

The purpose of this report is to identify and recommend, for increased support, research topics in information processing most likely to yield valuable results. Conclusions are based on a survey of information processing methods relevant to military command and control and, specifically, the subject of: heuristic programming, adaptive networks (e.g., perceptrons), artificial intelligence, pattern recognition, and information storage and retrieval. The survey consists of a comprehensive bibliography relying heavily upon other published collections, a set of original reviews of special topics such as machine programming, and a discussion ending in recommendations for support of research in six specific subject areas. (Author)

AD-418 191 Div. 32
OTS price $4.60

RAND Corp., Santa Monica, Calif.
''INTERZONAL TRADE'' IN GERMANY. PART I: THE TRADE AND THE CONTRACTUAL RELATIONS,
by Horst Mendershausen. July 63, 43p. Memo. RM3686PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Commerce, Political science).

The present paper outlines the subject, provides

statistical guides, and indicates the framework in which trade takes place today, after almost fifteen years of experience. It describes the constaints that have been imposed on the trade and some of the recent efforts to loosen them; and it suggests some of the problems concerning the effectiveness of these constraints, or their manipulation, on the behavior of the East German regime, e.g., special business interests in West Germany, the attitudes of business firms and governments in other Western countries, the ability of East Germany to deter or counter pressures on its crisis-ridden economy by resort to Soviet resources or to direct pressures on West Berlin. (Author)

AD-418 202 Div. 32, 16
OTS price $1.10

Maryland U., College Park.
INDEX CATALOGUE TO RUSSIAN, CENTRAL AND EASTERN EUROPEAN AND CHINESE LITERATURE IN MEDICAL ENTOMOLOGY.

Annual progress rept., 1 Oct 62-30 Sep 63, by George Anastos. 30 Sep 63, 5p.
Contract DA49 193md2238
Unclassified report

Descriptors: (*Insects, Indexes), Documentation, Dictionaries, Catalogs, Language, Processing.

This project consists of three parts: (1) the preparation of an index-catalogue of references in medical entomology from Russia, Eastern Europe and China, (2) translation of articles of general interest to medical entomologists, and (3) the preparation of a Russian-English, English-Russian glossary of terms in medical entomology. (Author)

33. TRANSPORTATION

No Entries

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk are included in the subject index.

ASTRONOMY

Astrophysics

N63-23036
Geophysical Inst., Univ. of Alaska, College.
NEGATIVE CORRELATION BETWEEN POLAR CAP VISUAL AURORA AND MAGNETIC ACTIVITY
T. N. Davis. [1963] 24p
NASA Technical memo X-50782
OTS $2.60

N63-20178
Goddard Inst. for Space Studies, National Aeronautics and Space Administration, New York.
THERMIONIC SCREENING OF BODIES IN ATMOSPHERE AND INTERPLANETARY SPACE
K. P. Chopra and C. S. Shen. 5 Apr 63, 32p
Technical memo X-50226
OTS $3.60

NASA-TN-D-1906
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
A THEORETICAL MODEL FOR SUNSPOT COOLNESS
R. K. Jaggi. Oct 63, 17p
N63-23708
OTS $0.50

N63-20194
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
TIDAL DISSIPATION IN THE MOON
William M. Kaula. [1963] 18p
NASA TM X-50232
OTS $1.60

N63-23806
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MARS ATMOSPHERIC ENTRY PARAMETRIC STUDY
J. M. Brayshaw. 15 Sep 63, 109p
Contract NAS7-100
Technical rept. no. 32-458; NASA CR-52271
OTS $9.10

AD-400 563
Lincoln Lab., Mass. Inst. of Tech., Lexington.
RADAR ASTRONOMY MEASUREMENT TECHNIQUES
P. E. Green, Jr. 12 Dec 62, 84p
Contract AF19(628)500
Technical rept. no. 282; AFESD TDR-62-279
OTS $8.10

DESCRIPTORS: *Radio astronomy, *Radar targets, Solar systems, *Radar reflections, Measurement, Target recognition, Doppler effect, Phase distortion, Motion, Magneto-optic effect, Polarization, Radio interferometers, Antenna radiation patterns, Rotation, Surface properties

This report is a review of currently available techniques for studying the properties of objects of interest in radar astronomy, which are usually spread radar targets. Spread targets are defined to be those that produce an observable smearing of the echo in range, or an observable rate of echo fluctuation, or both. The approach taken here in presenting the available material on spread target measurements is to follow what happens to the various attributes (amplitude, delay, phase, frequency shift, polarization) of an incident signal upon reflection from such a target.

N63-22880
RAND Corp., Santa Monica, Calif.
THE PHYSICS OF BALLOONS AND THEIR FEASIBILITY AS EXPLORATION VEHICLES ON MARS
S. M. Greenfield and M. H. Davis. Sep 63, 167p
Contract NAS7-100
R-421-JPL: NASA CR-51782
OTS $12.00

NASA-TN-D-2091
Space Technology Labs., Inc., Redondo Beach, Calif.
IONIZATION ASSOCIATED WITH HYPERVELOCITY IMPACT
J. F. Friichtenicht and J. C. Slattery. Aug 63, 21p
Contract NASw-561
N63-20609
OTS $0.75

BIOLOGICAL SCIENCES

TID-3913
Hawaii Marine Lab., Univ. of Honolulu.
A BIBLIOGRAPHY OF ARTICLES PERTINENT TO MARINE PRIMARY PRODUCTIVITY
Maxwell S. Doty, comp. Oct 63, 30p
Contract AT(04-3)15
TID-7633
OTS $0.75

OTS SB-455, Revised
Office of Technical Services, Dept. of Commerce, Washington, D. C.
BIOASTRONAUTICS. Sep 63, 31p
OTS Selective Bibliography SB-455, Revised
OTS $0.10

DESCRIPTORS: *Space biology, *Bibliographies, Physiology, Behavior, Food, Nutrition, Protective clothing, Space medicine,

Lists 433 domestic and foreign references on bioastronautics added to the OTS collection through September 1963. Covers research on physiology, biology, behavior, food, nutrition, and protective clothing. Includes also bibliographies, dictionaries, directories and surveys. (Author)

OTS SB-521
Office of Technical Services, Dept. of Commerce, Washington, D. C.
SPACE ENVIRONMENTAL CONDITIONS - BIOLOGICAL ASPECTS. Nov 63, 16p
OTS Selective Bibliography SB-521
OTS $0.10

DESCRIPTORS: *Space biology, *Bibliographies, *Space environmental conditions, *Closed-cycle ecological systems, Exobiology.

Lists 176 foreign and domestic references on biological aspects of space environmental conditions added to the OTS collection through September 1963. Includes reports on exobiology, closed ecological systems, waste disposal, waste recovery processes, food supply, algae, spacecraft atmosphere, space microbiology, etc. (Author)

OTS SB-519
Office of Technical Services, Dept. of Commerce, Washington, D. C.
SPACE MEDICINE. Sep 63, 20p
OTS Selective Bibliography SB-519
OTS $0.10

DESCRIPTORS: *Space medicine, *Bibliographies, Space environmental conditions.

Lists 240 domestic and foreign references on space medicine added to the OTS collection through September 1963. Includes reports on: effects of weightlessness, acceleration, deceleration, and impact; cardiovascular changes; closed cycle systems; sealed cabin atmosphere; space clothing; instrumentation; effects of confinement, stress, and isolation; visual problems; hearing and noise problems; radiation tolerance; heat tolerance; other "human tolerances"; space pathology; positioning reactions (postural vertical); toxic vapors and gases; food and nutrition; etc. (Author)

OTS SB-520
Office of Technical Services, Dept. of Commerce, Washington, D. C.
WEIGHTLESSNESS AND ACCELERATION. Sep 63, 23p
OTS Selective Bibliography SB-520
OTS $0.10

DESCRIPTORS: *Weightlessness, *Acceleration, *Bibliographies, *Space biology, Space environmental conditions, Space medicine.

Lists 268 domestic and foreign references on biological aspects of weightlessness and acceleration added to the OTS collection through September 1963. Includes reports on physiological functions; sensory, psychomotor, and motor functions; stress (psychology); magnetic shoes and walking; transfer of biologic fluids; culture media; crew accomodations; space hardware; biologistics; water immersion studies; etc. (Author)

TID-18337
Pittsburgh Univ., Pa.
TRACER ANALYSIS OF ENERGETICS IN A LOTIC ECOSYSTEM
Kenneth W. Cummins. 5 Apr 63, 19p
Contract AT(30-1)913
OTS $1.60

AD-412 649
Aerospace Medical Research Labs. (6570th), Aerospace Medical Div., Wright-Patterson AFB, Ohio.
LIFE SUPPORT SYSTEMS EVALUATOR CONSTRUCTION TECHNIQUES. Final rept. on Equipment for Life Support in Aerospace
William F. Mickelson. May 63, 21p
AMRL-TDR-63-43; N63-19437
OTS repriced $0.75

DESCRIPTORS: *Life support, Construction, Design, Feasibility studies, Test facilities, Plumbing.

The construction, plumbing, capability, and operation of the Life Support Systems Evaluator are described. The evaluator is a research tool for determining technical feasibility of techniques and principles involved in operation and design of life support equipment by integrated evaluation studies. The evaluator is operational and has provided very good results. (Author)

PB-163 909
Army Biological Labs., Frederick, Md.
MAINTENANCE OF GERMICIDAL ULTRAVIOLET INSTALLATIONS. Rept. on Safety Measures for Protection Against BW Research and Development Hazards
George J. Harris and Manuel S. Barbeito. Mar 63
Technical manual 2
OTS $1.60

DESCRIPTORS: *Ultraviolet equipment, *Ultraviolet radiation, Maintenance, Safety, Calibration, Disposal, Germicides, *Biological warfare, *Decontamination

This manual, designed for use by operating personnel, provides basic information on the types of ultraviolet (UV) lamps, factors affecting lamp output and lamp life, calibration of UV meters, measurement of UV intensity, disposal of UV lamps, and personnel protection against UV radiations. (Author)

Radiobiology

TID-14604
Argonne National Lab., Ill.
STUDIES ON Ra^{226}, Po^{210} AND Th^{228} IN BOVINE BONES AND TEETH
Elvira R. Di Ferrante. Oct 61, 18p
Contract W31-109-eng-38
UAC-5720
OTS $1.60

TID-13358(1st. Rev.)
Atomic Energy Commission. Div. of Biology and Medicine, Washington, D. C.
OFFSITE ECOLOGICAL RESEARCH OF THE DIVISION OF BIOLOGY AND MEDICINE. TERRESTRIAL AND FRESHWATER.
Vincent Schultz, ed. Mar 63, 127p
OTS $2.50

BNL-5915
Brookhaven National Lab., Upton, N. Y.
THE EFFECTS OF RADIATION ON TOTAL AND DNA SYNTHESIZING CELLS OF THE BONE MARROW AND BLOOD
A. Tsuya, I. Hayano, V. P. Bond, and T. M. Fliedner. 19 Jan 62, 24p
Contract AT(30-2)GEN-16
OTS $2.60

PNE-236P
California U., Los Angeles. School of Medicine.
FOOD-CHAIN RELATIONSHIPS OF IODINE-131 FOLLOWING TWO NUCLEAR TESTS IN NEVADA. Preliminary rept. on Project Sedan.
Frederick B. Turner and William E. Martin. 10 Oct 63, 70p
OTS $1.50

CHEMISTRY

NP-12397
European Co. for the Chemical Processing of Irradiated Fuels, Mol (Belgium).
ESTIMATION OF THE ATMOSPHERIC DILUTION FACTOR OF THE EUROCHEMIC PLANT CHIMNEY
J. J. H. Alderhout and H. H. P. Moeken. 6 Sep 61, 14p
Eurochemic technical rept. no. 118.
OTS $1.60

NP-12390
European Co. for the Chemical Processing of Irradiated Fuels, Mol (Belgium).
MEASUREMENT OF DENSITY BY BETA RAY ABSORPTION. Status rept.
L. Svansson and R. Winckler. 8 Dec 60, 34p
Eurochemic technical rept. no. 95.
OTS $3.60

NP-12396
European Co. for the Chemical Processing of Irradiated Fuels, Mol (Belgium).
A "MINIMUM SYSTEMATIC VARIANCE" METHOD FOR EVALUATING THE MOST PROBABLE VALUES OF TWO PARAMETERS
T. Erben. 31 Jul 61, 8p
Eurochemic technical rept. no. 114.
OTS $1.10

NP-12391
European Co. for the Chemical Processing of Irradiated Fuels, Mol (Belgium).
A NEW METHOD FOR DETERMINING THE STABILITY CONSTANTS OF SUCCESSIVE COMPLEXES
T. Erben. 11 Jan 61, 9p
Eurochemic technical rept. no. 96
OTS $1.10

NP-12398
European Co. for the Chemical Processing of Irradiated Fuels, Mol (Belgium).
X-RAY ABSORPTION METHOD FOR DETERMINING THE TBP CONTENT OF KEROSENE-BASED EXTRACTION SOLVENTS
B. Edwall and P. Wichmann. 16 Jan 62, 11p
Eurochemic technical rept. no. 132.
OTS $1.60

HW-75447
Hanford Atomic Products Operation, Richland, Wash.
SOLVENT EXTRACTION OF CESIUM BY DIPICRYLAMINE. III. SEMIWORKS DEMONSTRATION
C. L. Richardson. 15 Mar 63, 15p
Contract AT(45-1)1350
OTS $1.60

MITNE-30
Massachusetts Inst. of Tech., Cambridge.
THE EFFECT OF ALKYL AMINE TYPE ON THE EXTRACTION OF NITRIC ACID AND NITROSYL-RUTHENIUM NITRATO COMPLEXES
Tom H. Timmins and Edward A. Mason. 1 Apr 63, 116p
Contract W7405-eng-26
OTS $9.60

IDO-11004
Monsanto Research Corp., Dayton, Ohio.
ORGANIC COOLANT ESSENTIAL DATA. Annual rept. 1 Jan-31 Dec 62.
J. A. Ellard, C. D. King, M. V. Milnes, W. H. Hedley, and W. J. Moodie. 31 Jan 63, 125p
Contract AT(10-1)1088
MRC-DA-13
OTS $10.10

TID-18460
Oak Ridge Gaseous Diffusion Plant, Tenn.
INFORMATION ON BONDING IN XENON COMPOUNDS FROM INFRARED SPECTRA
D. F. Smith. 22 Apr 63, 14p
Contract W7405-eng-26
OTS $1.60

ORNL-3497
Oak Ridge National Lab., Tenn.
APPARATUS FOR THE GASOMETRIC STUDY OF SOLID-GAS REACTIONS: SODIUM FLUORIDE WITH HYDROGEN FLUORIDE AND URANIUM HEXAFLUORIDE.
Sidney Katz. 1963, 16p
Contract W7405-eng-26
OTS $0.50

ORNL-3488
Oak Ridge National Lab., Tenn.
CHEMISTRY DIVISION. Annual progress rept. for period ending 20 June 63. 1963, 152p
Contract W7405-eng-26
OTS $2.75

ORNL-TM-563
Oak Ridge National Lab., Tenn.
EUROCHEMIC ASSISTANCE PROGRAM. Progress rept. Jul-Dec 62.
E. M. Shank. 9 Apr 63, 44p
Contract W7405-eng-26
OTS $4.60

AD-405 806
Univ. of Southern California, Los Angeles.
FURTHER STUDIES OF THE TETRABORANE CARBONYL B_4H_8CO.
Technical rept. no. 10
John R. Spielman and Anton B. Burg. 15 May 63, 30p
Contract Nonr-228(13)
OTS $2.60

DESCRIPTORS: *Boranes, *Carbonyl radicals, Chemical reactions, Molecular structure, Spectra (Infrared), Nuclear magnetic resonance, Stereochemistry, Chemical equilibrium.

Tetraborane-8 carbonyl (B_4H_8CO) is made by the action of CO on either B_4H_{10} or B_5H_{11}, suggesting the processes $B_4H_{10} \rightarrow B_4H_8 + H_2$ and $B_5H_{11} \rightarrow B_4H_8 + BH_3$. The reversal of these (significant for polyborane interconversion mechanisms) is shown by the high yields of B_4H_{10} and B_5H_{11} obtained when H_2 or B_2H_6 reacts with B_4H_8CO. Basic reagents attack B_4H_8CO to form nonvolatiles without liberation of any CO; dimethyl ether and water behave so, and trimethylamine forms some $(CH_3)_3NBH_3$. Ethylene also fixes the CO, in a slightly volatile unstable compound, $(C_2H_4)_4B_4H_8CO$ (structure uncertain), whereas $BH_3CO + 3C_2H_4 \rightarrow (C_2H_5)_3B + CO$ is quantitative. With excess PF_3, B_5H_{11} forms BH_3PF_3 and $B_4H_8PF_3$, from the latter of which CO reversibly displaces PF_3; in these reactions CO is not irreversibly fixed.

AD-278 292
Gottingen Univ. (West Germany).
INVESTIGATION OF GASEOUS DETONATIONS AND SHOCK WAVE EXPERIMENTS WITH HYDRAZINE.
Rept. for 1 Oct 59-30 Sep 60, on Research in Chemical Energetics
W. Jost. Apr 62, 84p
Contract AF61(514)1142
ARL 62-330; N62-14047
OTS $8.10

DESCRIPTORS: *Hydrazines, Gases, Turbulence, Velocity, Decomposition, Kinetic theory, Reaction kinetics, Temperature, Thermodynamics, Flame propagation, Mathematical analysis, Test methods, Tests, *Shock waves, *Detonations.

The implications of the "Chapman-Jouguet" condition are discussed and examined experimentally. Furthermore, investigations of the shape of a detonation front and its dependence on the reaction are reported. Experiments were made to demonstrate the influence of turbulence in the unignited gas and of obstacles to the gas flow upon the initiation time and distance for the development of a detonation. The detonability of pure hydrazine was checked. The decomposition of hydrazine, diluted with inert gas, in reflected shock waves at extremely low oxygen concentration was observed to occur with an apparent energy of activation of about 43kcal/mole (total reaction pressure ca. 7.2 atm; hydrazine density 23.10^{-8} mole/cm^3). (Author)

Physical Chemistry

AD-406 141
Brown Univ., Providence, R. I.
THE VISCOSITY OF CARBON DIOXIDE IN THE NEIGHBORHOOD OF THE CRITICAL POINT
J. Kestin, J. H. Whitelaw, and T. F. Zien. Apr 63, 46p
Contract Nonr-3620(00)
Proj. Squid Technical rept. BRN-5-P; N63-16408
OTS $4.60

DESCRIPTORS: *Carbon dioxide, *Viscosity, Gravity, Temperature, Test methods, Tables.

The paper contains the results of a new determination of the viscosity of carbon dioxide in the single-phase region surrounding the critical dome. The determination was performed in a modified oscillating-disk viscometer used earlier for the determination of the viscosity of several noble gases and steam. The results show that the anomalies in the dynamic viscosity of carbon dioxide are rather mild, and several orders of magnitude lower than those reported by A. Michels, A. Botzen and W. Schuurman. The kinematic viscosity, however, exhibits a region of very rapid change with pressure at constant temperature. An attempt was made to provide a very crude estimate of the effect of density stratification in the terrestrial gravitational field in the neighborhood of the critical dome. (Author)

EARTH SCIENCES

TEM-1104
Geological Survey, Washington, D. C.
RECONNAISSANCE FOR RADIOACTIVE ROCKS IN THE PAULO AFONSON REGION, BAHIA, BRAZIL.
Preliminary rept.
Donald D. Haynes and Henry Mau. Jan 58, 8p
OTS $0.50

NASA-TN-D-1850
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
THE INFRARED HORIZON OF THE PLANET EARTH
R. A. Hanel, W. R. Bandeen, and B. J. Conrath.
Sep 63, 25p
N63-20603
OTS $0.75

N63-23024
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
MAGNETIC SURVEY DATA AVAILABLE PRIOR TO THE WORLD MAGNETIC SURVEY EFFORT OF THE IQSY
S. Hendricks and J. C. Cain. [1963] 31p
X-611-63-12; NASA TM X-50956
OTS $3.60

AD-405 628
Pacific Science Board, National Academy of Sciences National Research Council, Washington, D. C.
EFFECTS OF HURRICANE HATTIE ON THE BRITISH HONDURAS REEFS AND CAYS, OCTOBER 30-31, 1961. Atoll Research bull. no. 95
R. D. Stoddart. 15 May 63, 205p
Contract Nonr-2300(12)
OTS $14.00

DESCRIPTORS: *Tropical cyclones, Storms, Damage, *Honduras, *Reefs, Terrain, Plants (Botany), Economics, Coral reefs.

Contents:
Introduction
Hurricane hattie
Reef damage during hurricane hattie
Hurricane damage to northern barrier reef cays
Hurricane damage to central barrier reef cays
Hurricane damage on turneffe islands
Hurricane damage on lighthouse reef
Summary of physiographic effects
Vegetational effects of the hurricane
Human and economic results of the hurricane
Post hurricane adjustments and prospect
Appendices
References cited

Climatology and Meteorology

PB-163 887
Deutscher Wetterdienst, Frankfurt-am-Main (West Germany).
STUDIES IN NUMERICAL WEATHER FORECASTING. Final technical rept. 1 Jul 54-30 Jun 57
K. Hinkelmann, 30 Jun 57, 583p refs
Contract AF61(514)735-c, continuation of Contract AF61(514)434
AFCRC-TR-58-214; AD-231 773
OTS $26.00

DESCRIPTORS: *Weather forecasting, Meteorological data, Test methods; Mathematical analysis, Meteorology.

Contents:
On the Applicability of Non-geostrophic Motions for Numerical Weather Forecasting
On the Technics of Solving Prognostic Equations
Research on Further Effects on Atmospheric Motions

AD-412 328
Douglas Aircraft Co., Inc., Long Beach, Calif.
NB-66B HIGH ALTITUDE GUST SURVEY: TIME SERIES. Final rept. on High Level Turbulence
J. A. Strom and G. T. Weathermon. Jun 63, 202p
Contract AF33(616)7647
LB-31236; ASD-TDR-63-145, Volume III
ORS repriced $3.50

DESCRIPTORS: *Gusts, Velocity, *Wind, Time, *Meteorological parameters, Periodic variations, Turbulence, High altitude, Penetration, Thunderstorms, Experimental data, Measurement, Records, Recording paper, *Graphic analysis.

Time series plots for vertical, lateral, forward and derived gust velocities are presented. Time series plots for true airspeed, pressure altitude, outside air temperature and normal acceleration (measured at the radome) for 14 of the more severe penetrations are also presented. (Author)

AD-405 627
Hawaii Inst. of Geophysics [Honolulu].
SOME ASPECTS OF THE METEOROLOGY OF THE TROPICAL PACIFIC VIEWED FROM AN ATOLL. Atoll Research bull. no. 96
Ronald L. Lavoie. 15 May 63, 87p
Contracts AF19(604)7229 and Nonr-2300(12)
Contribution no. 51
OTS $8.10

DESCRIPTORS: *Marine meteorology, *Climatology, Pacific Ocean, Tropical regions, Pacific Islands, Diurnal variations, Meteorology.

Contents:
Eniwetok as an observing platform
Diurnal variations
Synoptic-scale disturbances

NASA-TN-D-1821
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
DYNAMIC RESPONSE OF RISING AND FALLING BALLOON WIND SENSORS WITH APPLICATION TO ESTIMATES OF WIND LOADS ON LAUNCH VEHICLES
Wilmer H. Reed III. Oct 63, 33p
N63-23362
OTS $1.00

ORO-599
Weather Bureau Research Station, Oak Ridge, Tenn.
DEPOSITION AND WASHOUT COMPUTATIONS BASED ON THE GENERALIZED GAUSSIAN PLUME MODEL
Walter M. Culkowski. 30 Sep 63, 26p
OTS $0.50

ENGINEERING

AGN-8062
Aerojet-General Nucleonics, San Ramon, Calif.
ENGINEERING INVESTIGATIONS OF CENTRIFUGAL CREEP TESTING MACHINE. Final rept.
Feb 63, 187p
Contract AT(04-3)368
OTS $13.00

Aeronautical Engineering

NASA-TN-D-1965
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
FLIGHT- AND FORCE-TEST INVESTIGATION OF A MODEL OF AN AERIAL VEHICLE SUPPORTED BY TWO UNSHROUDED PROPELLERS
Robert H. Kirby. Sep 63, 27p
N63-20607
OTS $0.75

NASA-TM-X-86
Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio
EXPERIMENTAL INVESTIGATION OF A 0.35 HUB-TIP RADIUS RATIO TRANSONIC AXIAL FLOW ROTOR DESIGNED FOR 40 POUNDS PER SECOND PER SQUARE FOOT WITH A DESIGN TIP DIFFUSION FACTOR OF 0.20
Paul T. Yasaki and John C. Montgomery. Sep 59, declassified 17 Jul 62. 37p
OTS $1.00

NACA-RM-E51E01
Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
PERFORMANCE CHARACTERISTICS OF AIRCRAFT COOLING EJECTORS HAVING SHORT CYLINDRICAL SHROUDS
Fred D. Kochendorfer and Morris D. Rousso. 22 May 51, declassified 8 Feb 63, 39p.
OTS $1.00

AD-405 740
National Aeronautical Establishment, Ottawa (Canada).
ESTIMATION OF MINIMUM FIELD REQUIREMENTS OR TWO OVERLOADED, PROPELLER-DRIVEN, TILT-WING VTOL AIRCRAFT (INCLUDING THE EFFECTS OF FLAP SETTING, RUNWAY SURFACE, WIND, WING TILT RATE AND FLAP BOUNDARY LAYER CONTROL
B. Neal and H. N. C. Lyster. Jan 63, 43p
Aeronautical rept. LR-373; N.R.C. no. 7351
OTS $4.60

DESCRIPTORS: *Vertical take-off planes, *Take-off, *Landing, Runways, Flaps, Boundary layer control, Variable-incidence wings, Aerodynamic characteristics.

Minimum take-off and landing distances are calculated for two overloaded, propeller-driven, tilt-wing VTOL aircraft. The effects of flap setting, runway surface, wing tilt rate and flap boundary layer control are considered at various thrust-to-weight ratios. It appears that take-off to and landing from a 50-foot obstacle can be achieved in 400 feet at an all-up-weight 60 percent greater than the VTO all-up-weight. (Author)

Chemical Engineering

ORNL-TM-355
Oak Ridge National Lab., Tenn.
CHEMICAL TECHNOLOGY DIVISION. Monthly progress rept. for Aug 62.
M. E. Whatley, P. A. Haas, R. W. Horton, A. D. Ryon, and J. C. Suddath. Aug 62, 95p
Contract W7405-eng-26
OTS $8.60

ORNL-TM-412
Oak Ridge National Lab., Tenn.
CHEMICAL TECHNOLOGY DIVISION. Monthly progress rept. for Oct 62.
M. E. Whatley, P. A. Haas, R. W. Horton, A. D. Ryon, and J. C. Suddath. 29 Apr 63, 64p
Contract W7405-eng-26
OTS $6.60

ORNL-3496
Oak Ridge National Lab., Tenn.
CHEMICAL TECHNOLOGY DIVISION, CHEMICAL DEVELOPMENT SECTION C, SEPARATIONS CHEMISTRY AND SEPARATIONS PROCESS RESEARCH. Progress rept. for Jan-Jun 63.
K. B. Brown. 1963, 114p
Contract W7405-eng-26
OTS $2.50

Civil Engineering

PB-163 889
Ammann and Whitney, New York.
ENGINEERING STUDY OF ATOMIC BLAST RESISTANT DESIGN FOR SEVERAL BUILDING TYPES, APPENDIX H. Mar 60, 132p
Contract DA49-129-eng-317
OTS $10.50

DESCRIPTORS: *Buildings, *Shelters, *Underground structures, Foundations, Design.

Drawings of protective construction for:
Administration building
Communications building
Warehouse
Earth covered; concrete igloo; rectangular; double barrel arch; dome
Buried: rectangular; double barrel arch; dome; concrete igloo (See also PB-163 888)

PB-163 888
Ammann and Whitney, New York.
ENGINEERING STUDY OF ATOMIC BLAST RESISTANT DESIGN FOR SEVERAL DIFFERENT BUILDING TYPES. Mar 60, 211p
Contract DA49 129-eng 317
OTS $14.50

DESCRIPTORS: *Buildings, *Shelters, *Underground structures, Foundations, *Nuclear explosion damage, Design, Costs, Transonic characteristics, Radiation effects, Attenuation.

This report summarizes the results of an engineering study of several building types to determine (a) the practicability of design for atomic blast resistance, (b) the estimated construction cost for a range of blast pressure loadings and a comparison of costs with conventional construction, and (c) the estimated additional cost of providing personnel shelter areas.

Electrical and Electronic Engineering

N63-22584
Allison Div., General Motors Corp., Indianapolis, Ind.
DEVELOPMENT AND TESTING OF ELECTROLYTE MATRIX COMBINATIONS FOR MERCURY-POTASSIUM FUEL CELLS.
Quarterly technical progress rept. no. 2, 13 Mar-12 Jun 63
V. L. Decker and T. F. Nagey. 10 Jul 63, 42p
Contract NASw-476
Engineering department rept. no. 3455; NASA-CR-51566
OTS $4.60

N63-23650
Connecticut Univ., Storrs.
THE DIRECT METHOD OF LIAPUNOV APPLIED TO THE DESIGN OF CONTROLLERS FOR A CLASS OF NONLINEAR AND TIME VARYING PROCESSES
Richard V. Monopoli. 29 Aug 63, 30p
Grant NsG-309-63
NASA CR-52239
OTS $2.60

N63-20195
Electronic Communications, Inc., Timonium, Md.
TECHNIQUES FOR SUPERHETERODYNE RECEIVERS ABOVE 100 GIGACYCLES. Final rept.
R. F. Packard, ed. May 63, 73p
Contract NASw-259
NASA CR-50881
OTS $7.60

NASA-TN-D-1904
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
THEORETICAL CONSIDERATIONS FOR A PRELIMINARY DESIGN OF A SOLAR CELL GENERATOR ON A SATELLITE
Bernard J. Saint-Jean. Sep 63, 32p
N63-20606
OTS $1.00

AD-400 955
Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE DIAMOND CIRCUIT
R. H. Baker, R. E. McMahon, and R. G. Burgess. 30 Jan 63, 32p
Contract AF19(628)500
Technical rept. no. 300; AFESD TDR-63-64
OTS $3.60

DESCRIPTORS: *Electrical networks, *Circuits, *Analog-digital computers, Transistors, Design.

A transistor bridge network is described, and the utilization of the basic circuit and several of its derivatives in the design of data processing systems is illustrated. Network derivations are given in order to show the relation of accuracy, speed, and power consumption. (Author)

AD-294 963
Lincoln Lab., Mass. Inst. of Tech., Lexington.
HIGH-POWER TUBE PROGRAM. Semiannual technical summary rept. on Proj. Defender. 31 Dec 62, 39p
Contract AF19(628)500; ARPA Order 85
AFESD TDR-62-267
OTS $3.60

DESCRIPTORS: *Klystrons, *Beam power tubes, *Electron tubes, Radiofrequency power, Microwaves, Electron beams, Vacuum systems, Cathodes, (Electron tubes), Diodes, Electric discharges, Design,

Contents:
Klystron interaction
Biased collector
Beam pulse heating
Vacuum voltage breakdown
Beam studies
Thermionic cathodes and vacuum techniques
Duplexers

AD-292 731
Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE MEASUREMENT OF SMALL-SIGNAL PARAMETERS OF TRANSISTORS AT VHF
B. L. Diamond. 14 Nov 62, 24p
Contract AF19(628)500; ARPA Order 56
Technical rept. no. 286; AFESD-TDR-62-254
OTS $2.60

DESCRIPTORS: *Transistors, Very high frequency, Circuits, Measurement, Electrostatic capacitance, Impedance,

This report discusses in detail the measurement of the small-signal parameters of transistors in the 1- to 100-Mcps frequency range. In order to arrive at the best set of parameters for measurement purposes the basic approach is to study the properties of three-terminal networks together with practical considerations like the availability of suitable instruments, the accuracy of measurement, and so on. The set of parameters - y_{11e}, y_{11b}, y_{22e}, and h_{22e} - can be measured with a maximum error of approximately 4 percent. These four parameters can be transformed by computations to any of the small-signal parameter sets (y, z, g, h, a or b parameters), for any transistor configuration (common base, common emitter, or common collector) with a worst-case error of roughly 20 percent in the least significant parameter. Some results of a transistor measurement program are also included to demonstrate the expected behavior of typical transistors. (Author)

AD-400 113
Lincoln Lab., Mass. Inst. of Tech. Lexington.
RANDOM NOISE IN AMPLITUDE COMPARISON MONOPULSE SYSTEMS
J. W. McGinn, Jr. 7 Feb 63, 27p
Contract AF19(628)500; ARPA Order no. 56
Rept. no. 47G-7; AFESD TDR-63-28
OTS $2.60

DESCRIPTORS: *Radio interference, *Noise, *Angle of arrival, Signal-to-noise ratio, Radar antennas, Probability, Statistical processes, Monopulse radar,

This report studies the effect of random noise on amplitude comparison monopulse signal processing. The goal is to answer three questions: (1) what is the form of the maximum likelihood estimate of angle of arrival in the presence of random noise; (2) what is the probability density function of such an estimate; (3) what is an appropriate measure of the precision of the estimate for the zero angle of arrival condition?

AD-278 945
Space Technology Labs., Inc., Los Angeles, Calif.
TITANIUM PRIMARY BATTERY RESEARCH PROGRAM AT REMINGTON ARMS, INC.
R. W. Schult. 19 Nov 59, 16p
TM-59-0000-09424; AFBMD Document no. 61-06-5084
OTS $1.60

DESCRIPTORS: *Batteries and components, *Primary cells, *Anodes (Electrolytic cell), *Titanium alloys, Aluminum alloys, Boron alloys, Beryllium alloys, Electrolytes, *Electrochemistry,

By varying the amounts of alloying elements added to titanium, the chemical and electrochemical properties of the anode can be controlled to provide electrodes with a variety of properties, depending on the purpose for which the cells will be used. The titanium anode-electrolyte systems appear to be applicable to the following three types of primary cells: (1) low current drain, long shelf life cells; (2) cells for use at elevated temperatures; (3) high current drain, reserve-type cells.

PB-163 894
Stanford Electronics Labs., Stanford Univ., Calif.
THE EFFECTS ON THE LIMITING PROCESSES OF ASYMMETRY IN A TRANSISTOR LIMITER
A. Mas Fernandez-Yañez. 13 Aug 59, 37p
Contract DA36-039-sc-78296
Technical rept. no. 755-1; AD-227 143
OTS $3.60

DESCRIPTORS: *Semiconductor devices, *Transistors, *Limiters, *Clipper circuits, *Modulators, Fourier analysis,

The use of transistors in limiter circuits can be a cause of asymmetry, due to inherent differences in transistor characteristics. The object of this research is to make a study of the consequences of this asymmetry in a limiting process. A special type of precision transistor limiter with controllable symmetry was designed, and the effects of the asymmetry were analyzed and measured for different kinds of input signals. It was concluded that asymmetry in a limiter makes the limiting process ineffective by introducing undesired components in the output not present in the input. (Author)

TID-18271
Westinghouse Electric Corp., Elmira, N. Y.
DEVELOPMENT OF A HIGH SPEED PHOTOMULTIPLIER
Progress rept. 2 Oct 62-2 Jan 63.
W. Wade Sapp. 26 Mar 63.
Contract AT(30-1)2825
OTS $3.60

Ordnance, Missiles, and Satellite Vehicles

PB-163 907
ARINC Research Corp., Washington, D. C.
A METHOD FOR DETERMINING THE COST OF FAILURES
David E. Van Tijn. 21 May 62, 34p
Contract AF33(657)7482
Publication no. 206-2-298
OTS $3.60

DESCRIPTORS: *Costs, Armed forces budgets, Mathematical models, *Weapon systems, *Reliability, Logistics,

Cost predictions for weapons support are based on the same general principles, and developed by the same general methods, as reliability predictions for equipments. Therefore, the step-by-step procedure for developing a mathematical model for cost allocation -- on which the cost predictions are based -- is analogous to the well-established procedures for developing reliability allocation models. This paper presents a sequential set of rules for establishing a cost model, exemplified by application to an actual Air Force weapon support system. (Author)

N63-23023
Environmental Research Associates, Randallstown, Md.
SPACE STATION CONNECTION AND SEAL STUDY
Harry L. Loats, Jr. Oct 62, 149p
Contract NAS1-2164
NASA CR-51303
OTS $11.00

N63-23807
General Dynamics/Fort Worth Tex.
MEASURED EFFECTS OF THE VARIOUS COMBINATIONS OF NUCLEAR RADIATION, VACUUM, AND CRYOTEMPERATURES ON ENGINEERING MATERIALS. Quarterly progress rept., 1 Jun-31 Aug 63
E. E. Kerlin and E. T. Smith. 30 Sep 63, 122p
Contract NAS8-2450
GD/FW report FZK-172; NASA CR-52319
OTS $10.10

NASA-TN-D-1841
General Mills Electronics Div., Minneapolis, Minn.
CHARACTERISTICS OF PASSIVE COMMUNICATION SATELLITES WITH LAMBERTIAN SURFACES
Herbert P. Raabe. Sep 63, 17p
Contracts NAS5-890 and NAS5-1598
N63-20601
OTS $0.50

Presented at the XIII International Astronautical Congress, Varna, Bulgaria, September 28, 1962.

NASA-TN-D-1903
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
ARIEL I - EVOLUTION OF ITS STRUCTURE
Carl L. Wagner, Jr. Sep 63, 45p
N63-20605
OTS $1.25

NASA-TN-D-1915
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
THE AUTOMATIC PICTURE TRANSMISSION (APT) TV CAMERA SYSTEM FOR METEOROLOGICAL SATELLITES
Rudolf A. Stampfl and William G. Stroud. Nov 63, 16p
N63-23679
OTS $0.50

N63-23034
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
THE ENVIRONMENTAL TEST PROGRAM AND SYSTEMS EVALUATION OF THE S-3 ENERGETIC PARTICLES SATELLITE
Frank A. Carr. 21 Jan 63, 277p
X-326-63-10; NASA TM-X-50853
OTS $17.50

NASA-TN-D-1683
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
FLIGHT VIBRATION DATA FROM THE DELTA 9 LAUNCH VEHICLE
Lloyd A. Williams. Oct 63, 24p
N63-23123
OTS $0.75

N64-10095
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
PROGRAMMER ELECTRONICS. ATMOSPHERIC STRUCTURE SATELLITE EXPLORER XVII (S-6)
J. N. Libby and J. C. Schaffert. Aug 63, 70p
X-632-63-168; NASA TM X-50997
OTS $6.60

N64-10091
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
SATELLITE ATTITUDE DETERMINATION: DIGITAL SENSING AND ON-BOARD PROCESSING
J. S. Albus and D. H. Schaefer. Jul 63, 22p
X-631-63-133; NASA TM X-50996
OTS $2.60

N63-23016
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
SATELLITE SITUATION REPORT, VOL. 3, NO. 17
31 Aug 63, 9p
X-533-63-1; NASA TM X-50613
OTS $1.10

N63-23013
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
SATELLITE SITUATION REPORT, VOL 3, NO. 19. 30 Sep 63, 20p
X-533-63-1; NASA TM-X-50910
OTS $1.60

N64-10093
Goodyear Aircraft Corp., Akron, Ohio.
STUDY ON METHODS OF STRUCTURALLY EVALUATING EXPANDABLE STRUCTURES HAVING POTENTIAL SPACE APPLICATIONS. Quarterly progress rept. no. 1, 1 Aug-1 Nov 62
N. L. Jeppensen, B. W. Reynolds, N. C. Costakos, N. E. Houtz, and E. Rottmayer. 30 Nov 62, 118p
Contract NASw-471
GER 10882, rev. A; supersedes GER 10882.
NASA CR-52077
OTS $9.60

N64-10113
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
THE DEEP SPACE INSTRUMENTATION FACILITY - SPACE PROGRAMS SUMMARY NO. 37-23, VOLUME III, 1 Jul-31 Aug 63. 30 Sep 63, 77p
Contract NAS7-100
NASA CR-52144
OTS $7.60

N63-23029
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EARTH-VENUS TRAJECTORIES, 1965-66
V. C. Clarke, Jr., R. Y. Roth, W. E. Bollman, T. W. Hamilton, and C. G. Pfeiffer. 15 May 63, 790p
Contract NAS7-100
Technical memo no. 33-99, v. 2, pt. B;
NASA CR-51681
OTS $31.00

NASA-TN-D-2009
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
DEVELOPMENT OF A SMOKE-TRAIL VEHICLE FOR APPLICATION TO WING-SHEAR MEASUREMENTS UP TO 80,000 FEET
Wade E. Lanford, Tom W. Perry, Jr., Hal T. Baber, Jr. and Franklin W. Booth. Nov 63, 26p
N63-23681
OTS $0.75

NASA-TN-D-1805
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
ERROR ANALYSIS OF SEVERAL METHODS OF DETERMINING VEHICLE POSITION IN EARTH-MOON SPACE FROM SIMULTANEOUS ONBOARD OPTICAL MEASUREMENTS
Harold A. Hamer and Alton P. Mayo. Jun 63, 32p
OTS $1.00

NASA-TN-D-2075
Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
EFFECT OF CONTACT ANGLE AND TANK GEOMETRY ON THE CONFIGURATION OF THE LIQUID-VAPOR INTERFACE DURING WEIGHTLESSNESS
Donald A. Petrash, Ralph C. Nussle, and Edward W. Otto. Oct 63, 24p
N63-23684
OTS $0.75

NASA-TN-D-1882
Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio
AN EXPERIMENTAL INVESTIGATION OF CHEMICAL REACTION BETWEEN PROPELLANT TANK MATERIAL AND ROCKET FUELS OR OXIDIZERS WHEN IMPACTED BY SMALL HIGH-VELOCITY PROJECTILES
Robert P. Dengler. Aug 63, 38p
OTS $1.00

NASA-TN-D-1831
Marshall Space Flight Center, National Aeronautics and Space Administration, Huntsville, Ala.
THE EFFECT OF PROPELLANT SLOSHING ON THE STABILITY OF AN ACCELEROMETER CONTROLLED RIGID SPACE VEHICLE
Helmut F. Bauer. Oct 63, 92p
N63-23677
OTS $2.25

NASA-TN-D-2125
National Aeronautics and Space Administration, Washington, D. C.
RECOMMENDATIONS AND EVALUATIONS OF MATERIALS-RESEARCH AREAS OF IMPORTANCE TO MISSILE AND SPACE VEHICLE STRUCTURES
Jack B. Esgar, Norris F. Dow, and William R. Micks, Oct 63, 31p
N63-23126
OTS $0.75

AD-414 350
Naval Ordnance Lab., White Oak, Md.
CHARTS FOR THE PARAMETERS OF MIGRATING EXPLOSION BUBBLES
H. G. Snay and Ruth V. Tipton. 15 Oct 62, 18p
NOLTR 62-184
OTS repriced $0.50

DESCRIPTORS: *Explosion bubbles, Mathematical analysis, *Underwater explosions, Bubbles, Motion, Energy, Equations, Surfaces, Oscillation, Graphic analysis.

Graphs are presented for the relative bubble energies, maximum radii, periods, and migrations of underwater explosion bubbles for four cycles of the bubble oscillation. The migration refers to the bubble maximum in each cycle. The position of the bubble minimum can be readily found by a simple computation. The graphs permit a convenient reading of these parameters for a wide range of conditions. (Author)

AD-415 008
Naval Ordnance Lab., White Oak., Md.
THE GROWTH TO DETONATION OF BINARY EXPLOSIVE MIXTURES
Howard S. Leopold. 16 Apr 63, 36p
NOLTR 63-129
OTS repriced $1.00

DESCRIPTORS: *Explosive materials, Detonations, Explosives initiators, Lead compounds, Azides, PETN, RDX, Mixtures, Sensitivity, Density, Velocity, Exploding wires.

The growth to detonation after initiation by exploding nichrome wires of lead azide and binary mixtures of lead azide with PETN or RDX was observed using a rotating mirror smear camera. The effects of mixture composition and loading pressure on the sensitivity and growth to detonation showed that the mixtures retained the sensitivity of the lead azide over a wide range of composition. Optimum detonation velocities were obtained for mixtures containing 40% by weight of secondary explosive, but the use of binary mixtures of the type reported on here in weapon detonators requires a definite minimum confinement for practicability. (Author)

PB-163 892
Naval Ordnance Test Station, China Lake, Calif.
A STUDY OF THE EFFECTS OF REFRACTION ON REVERBERATION
Lothrop Mittenthal. 7 Nov 55, 35p
Rept. no. NOTS 1284; NAVORD rept. 4962
OTS $3.60

DESCRIPTORS: *Acoustics, *Reverberation, Refraction, Ocean waves, *Acoustic torpedoes, Underwater sound, Equations, Mathematical analysis, *Refractive index,

Four quantities--elapsed time, true range, horizontal component of range, and the spreading term--all required in treating refraction problems by ray acoustic methods, are derived. Some of these have previously been calculated by others. Using these quantities, the surface reverberation equation is altered by change of variables of integration to a form more readily handled. From this, the approximate form as used at NOTS in the current Acoustics of the Medium Program is derived. Finally a wave-front approach to the problem is made, restricted to the case of one "layer." (Author)

AD-288 074
Space Sciences Lab., General Electric Co., Philadelphia, Pa.
GENERALIZED INTERPLANETARY TRAJECTORY STUDY. Final rept.
Martin A. Menk. Aug 62, 112p
Contract AF33(616)6296
WADD-TR-60-502, Part II
OTS $9.60

DESCRIPTORS: *Programming (Computers), Digital computers, *Satellite vehicle trajectories, *Interplanetary trajectories, *Celestial mechanics, Data processing systems, Operation, N-body problem, Perturbation theory,

The report presents the IBM 7090 computer program for determining the initial velocity for an interplanetary trajectory when the departure and arrival date are specified, with the departure analysis maximizing the contribution derived from the rotation of the departure planet. Ephemeris positions of the Moon and all main planets, except Pluto, are used for perturbation computations. (Part I). The integration methods Cowell and Encke can be used. (Author)

AD-286 884
Space Sciences Lab., General Electric Co., Philadelphia, Pa.
GENERALIZED INTERPLANETARY TRAJECTORY STUDY. SUPPLEMENT 1: OPERATIONAL PROCEDURE FOR THE INTERPLANETARY TRAJECTORY PROGRAM. Final rept.
Martin A. Menk. Aug 62, 70p
Contract AF33(616)6296
WADD-TR-60-502, Part II, Supplement 1
OTS $6.60

DESCRIPTORS: *Programming (Computers), Digital computers, *Interplanetary trajectories, Celestial mechanics, *Satellite vehicle trajectories, Data processing systems, Operation, N-body problem, Interstellar matter,

This report describes an IBM 7090 computer program in detail and presents an operational procedure for the interplanetary trajectory program. This report discusses the input and the output of the interplanetary trajectory program and gives a computer flow chart, two sample runs with input and output and a tabulation of Julian days, Calendar days and Table days for the years' 1960 to the end of 1964. (Author) (See also AD-288 074)

Sanitation and Safety Engineering

ORNL-3361
Oak Ridge National Lab., Tenn.
ACTIVITY RELEASE FROM THE N.S. SAVANNAH IN THE MAXIMUM CREDIBLE ACCIDENT
T. D. Anderson, J. R. Buchanan, W. B. Cottrell, M. H. Fontana, and O. H. Klepper. 1963, 115p
Contract W7405-eng-26
OTS $2.50

ORNL-TM-569
Oak Ridge National Lab., Tenn.
PORT EVALUATION SURVEYS FOR N.S. SAVANNAH
S. I. Kaplan. 18 Apr 63, 12p
Contract W7405-eng-26
OTS $1.60

OTS SB-448, Revised
Office of Technical Services, Dept. of Commerce, Washington, D. C.
AIR POLLUTION AND PURIFICATION. Sep 63, 26p
OTS Selective Bibliography SB-448, Revised
OTS $0.10

DESCRIPTORS: *Atmospheric pollution, *Purification, Air, *Bibliographies, Beryllium,

Lists 360 domestic and foreign references on air pollution and purification added to the OTS collection through September 1963. Includes reports dealing with air pollution by non-radioactive fumes, industrial gases, smokes, aerosols, etc., with a special section on beryllium air contamination. Excludes atomic, bacteriological and chemical warfare agents. (Author)

Ship Building

PB-163 876
David Taylor Model Basin, Washington, D. C.
CALCULATION OF FLEXURAL CRITICAL FREQUENCIES OF SHIP HULLS BY PROHL'S METHOD
E. J. Adams and A. R. Welch. Jul 47, 10p
Rept. 582
OTS $1.10

DESCRIPTORS: *Ship hulls, *Vibration, Deformation, Boundary value problems, Punched cards, Curve fitting, Numerical analysis, Inertia,

This report extends Prohl's method for the calculation of critical speeds of flexible rotors to calculating flexural critical frequencies of ships. The method is simplified and set up so that the computations can be readily made with a punch-card machine. The method is applied to a uniform bar as a check. (Author)

PB-163 875
David Taylor Model Basin, Washington, D. C.
CALCULATION OF NORMAL MODES AND NATURAL FREQUENCIES OF SHIP HULLS BY MEANS OF THE ELECTRICAL ANALOG
Edward Kapiloff. Jul 54, 31p
Rept. 742
OTS $3.60

DESCRIPTORS: *Ship hulls, *Vibration, Deformation, Shear stresses, Differential equations, Electrical networks, Analog systems, Numerical analysis, Inertia,

The electrical analog for the transverse vibration of a nonuniform beam with both shear and bending flexibility is reviewed to illustrate the general method of development of such a network. Since elastic motion of any one type may be represented by an electrical transmission line, it is shown that for continuous systems with more than one type of mutually coupled motion the electrical analog will consist of a transmission line for each type of motion with the mechanical coupling simulated by a mutual impedance. This method is further illustrated by the development of the electrical analog for a nonuniform beam that has torsional motion coupled with bending. Inasmuch as the dynamics of transverse vibration of a nonuniform beam with shear and bending flexibility are those for the vertical flexure of a ship hull considered as a free, continuous, nonuniform beam, the practical application of the analog is shown by presenting the normal modes of vertical flexure of a naval vessel. (Author)

PB-163 874
David Taylor Model Basin, Washington, D. C.
COMPARISON BETWEEN THEORETICALLY AND EXPERIMENTALLY DETERMINED NATURAL FREQUENCIES AND MODES OF VIBRATION OF SHIPS
R. T. McGoldrick. Aug 54, 19p
Rept. 906
OTS $1.60

DESCRIPTORS: *Ship hulls, *Vibration, Deformation, Shear stresses, Vibrators (Mechanical), Theory, Experimental data, Analysis, Electrical networks, Analog systems, Frequency.

The results of vibration-generator tests and theoretical calculations of natural frequencies and normal modes of vibration on eight vessels of widely different types are discussed in this progress report. The tests were made with the TMB medium vibration generator producing driving forces up to 30,000 lb single amplitude. The calculations were made by means of the TMB electrical network analyzer. The errors in the calculated frequencies are tabulated. By using correction factors for the various modes based on the accumulated experimental data, more reliable estimates should be possible in the future. Data on the horizontal modes are also given, but coupling between horizontal and torsional motions requires further investigation before the reliability of predictions of horizontal modes can be forecast. (Author)

PB-163 877
David Taylor Model Basin, Washington, D. C.
PREPARATION OF DATA FOR COMPUTATION OF VERTICAL FLEXURAL MODES OF HULL VIBRATION BY DIGITAL PROCESS
Alice W. Mathewson. Sep 49, 13p
Rept. 632
OTS $1.60

DESCRIPTORS: *Ship hulls, *Vibration, Deformation, Shear stresses, Difference equations, Curve fitting, Digital computers, Numerical analysis, Inertia.

A method is described by which the flexural modes of hull vibration can be calculated—while the ship is still in the design stage—by digital computation. Although the method shows promise of applicability to both horizontal and vertical flexural modes, it is presently recommended for preparation of data on vertical modes only. (Author)

PB-163 878
David Taylor Model Basin, Washington, D. C.
THE STEADY-STATE RESPONSE OF A SHIP HULL TO A SIMPLE HARMONIC DRIVING FORCE COMPUTED BY A DIGITAL PROCESS
Emily J. Adams. May 50, 25p
Rept. 715
OTS $2.60

DESCRIPTORS: *Ship hulls, *Vibration, Deformation, Shear stresses, Difference equations, Harmonic analysis, Digital computers, Numerical analysis, Inertia.

A numerical method of finding the steady-state response of the hull of a ship to a sinusoidal driving force is described. Results of calculations for the vertical flexural vibrations of the USS NIAGARA (APA87) in response to a vertical driving force applied in the plane of the propeller are given and are compared with experimental data. It is also shown that the vibration of the hull at a frequency other than one of the natural-mode frequencies may be calculated as the sum of the vibrations of the natural modes compounded by a normalization process. In the Appendix a brief set of instructions is given which may be used for the computation of forced vibration. (Author)

PB-163 873
David Taylor Model Basin, Washington, D. C.
VIBRATION STUDIES OF SHIP HULLS BY MEANS OF VIBRATION GENERATORS
Virgil S. Hardy. Nov 49, 34p
Rept. C-80
OTS $3.60

DESCRIPTORS: *Ship hulls, *Vibration, Deformation, *Vibrators (Mechanical), Tests, Experimental data, Analysis.

Hull vibration data obtained from vibration tests on twelve ships are summarized in this report. Where sufficient data are available, the vibration coefficients in Schlick's and Burrill's formulas are evaluated; also logarithmic decrements, damping constants, and radii of curvature are determined. The maximum variation of the Burrill coefficients obtained from data supplied by the tests conducted in shallow water from the value of the constant proposed by Burrill is 15 percent. Burrill's version of Schlick's formula appears to give more consistent results for these data than the original Schlick formula. The frequencies of resonance for the three lowest modes of flexural vibration vary approximately as the numbers 1, 2, and 3. (Author)

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Engines and Propulsion Systems

NACA-RM-E56G27
Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
METHOD FOR SHORTENING RAM-JET ENGINES BY BURNING HYDROGEN FUEL IN THE SUBSONIC DIFFUSER
A. J. Cervenka and J. W. Sheldon. 17 Oct 56, declassified 5 Jun 62. 39p
OTS $1.00

AD-419 207
National Research Council of Canada, Ottawa. Div. of Mechanical Engineering
GAS TURBINE CYCLE CALCULATIONS: GENERATION OF THERMODYNAMIC DATA FOR DRY AIR AND COMBUSTION PRODUCTS
M. S. Chappell and E. P. Cockshutt. June 63, 30p
Aeronautical rept. LR-381
OTS $2.60

DESCRIPTORS: *Gas turbines, Operation, *Thermodynamics, Air, *Combustion products, Equations of state, Enthalpy, Entropy, Mathematical analysis,

A method is presented for generating thermodynamic data (specific heat, enthalpy, and entropy) as functions of temperature and fuel/air ratio, for ranges appropriate to gas turbine cycle calculations. Comparisons of the generally used tabulations of thermodynamic data are made, and specific algebraic expressions are developed which yield results in agreement with the tabulated data to within 0.1 percent precision over the temperature range from 200°K to 1400°K. Both the technique and the formulae presented are well suited for incorporation into cycle study programmes for digital computers. (Author)

N63-20244
Rocketdyne, Canoga Park, Calif.
INVESTIGATION OF COOLING PROBLEMS AT HIGH CHAMBER PRESSURES. Final rept. 9 Apr 62-8 Jan 63
W. S. Hines. May 63, 404p
Contract NAS8-4011
Rept. no. R-3999; NASA CR-50773
OTS $22.25

PB-163 890
Space Technology Labs., Inc., Los Angeles, Calif.
THERMONUCLEAR PROPULSION RESEARCH. Semi-annual rept., 1 Jan-30 Jun 60, [1960] 18p
Contract AF04(647)309
Rept. no. STL/TR-60-0000-09198; AFBMD-TR-60-114; AD-245 933
OTS $1.60

DESCRIPTORS: *Plasma physics, Rocket propulsion, *Thermonuclear reactions, Shock tubes, High speed cameras, Design, Magnetic fields, *Nuclear propulsion, Magnetic pinch.

Work on the superfast pinch assembly has consisted mainly of monitoring the behavior of the plasma in the pinch tube with high speed magnetic probes. A transverse pinch assembly has been constructed and tested. A field-free conducting plasma has been compressed by means of a fast rising B_Z magnetic field and held radially stable for times which are long compared to axial escape times. Controlled plasma bouncing and second cycle flux trapping have been observed. The conical shock tube has been used in a parametric study which has made it possible to formulate general ground rules for the design of this type of assembly. Work on the first model of the magnetically insulated shock tube has been completed. A new plug-in streak unit for the image converter camera has been completed. This unit aids in filling the gap between the writing rates of the image converter and the rotating mirror camera. (Author)

Transport, Traction and Hoist Facilities

PB-181 132, Rev.
Bureau of Yards and Docks, Washington, D. C.
TRACKAGE FORMULAS. Engineered Performance Standards, Public Works Maintenance. Rev. Aug 63, 47p
NAVDOCKS P-714-1, supersedes pubs. of Aug 58, May 59, PB-139 131, and Jan 61, PB-181 132
OTS $1.25

DESCRIPTORS: *Railroad tracks, Maintenance, *Handbooks, Standards.

Formulas are given for:
Remove and Reinstall Tires
Remove and Reinstall Rail
Surface and Align Rail
Install Gauge Rods
Install and Remove Rail Anchors
Materials Handling
Install Tie Plates

NP-12393
European Co. for the Chemical Processing of Irradiated Fuels, Mol (Belgium).
PRESENT TRENDS IN FUEL TRANSPORTATION
F. Marcus. 6 Jun 61, 27p
Eurochemic technical rept. no. 109
OTS $2.60

MATERIALS

AD-271 456
Rock Island Arsenal Lab., Ill.
A CORROSION PROTECTIVE RESIN-BONDED DRY FILM LUBRICANT SYSTEM WHICH PROVIDES GOOD WEAR LIFE
F. S. Meade and G. P. Murphy. 16 Nov 61, 19p
Rept. no. 61-4164
OTS $1.60

DESCRIPTORS: *Corrosion inhibition, *Films, *Lubricants, *Thermosetting plastics, *Resins, Wear resistance, Test methods, Sea water, Humidity cabinets, Friction,

Variations in the dry film lubricant formulation and surface pretreatment of bearing areas were made in an effort to improve the corrosion protection provided by a highly effective resin-bonded dry film lubricant. The corrosion protection provided by the resulting films and pretreated surfaces were evaluated by means of both the salt spray and humidity cabinets.

Ceramics and Refractories

TID-18480
General Electric Co., Cincinnati, Ohio.
ELECTRON MICROSCOPY OF SINTERED BERYLLIA
Robert C. Rau. 22 Apr 63, 24p
Contract AT(40-1)2847
OTS $2.60

AD-402 795
Illinois Univ., Urbana.
THE PHENOMENON OF FRACTURE AND THE FRACTURE MORPHOLOGY OF GLASS TESTED IN TENSION, FLEXURE AND TORSION. Technical memo. no. 190
N. M. Cameron, Apr 63, 118p
Contract Nonr-2947(02)
T&AM rept. no. 242; N63-15408
OTS $9.60

DESCRIPTORS: *Glass, Rods, Tensile properties, Stresses, Fracture (Mechanics), Microstructure, Composite materials,

A method of testing glass rods in tension and torsion was devised. Two types of glass, Pyrex and Soda-lime, were tested in tension, flexure and torsion and the data analyzed by both Normal and Weibull statistics. A significant difference in strength was found to exist between the tension and flexural techniques of testing of similar specimens of Soda-lime glass. This difference is explained by the size effect brought about by the pre-existing flaw concept. A significant difference was also found between similar specimens of Pyrex and Soda-lime when both were tested in tension. This is explained by a difference in intrinsic strengths of the two glasses. Explanations are put forward concerning the formation of certain fracture markings and light and electron micrographs are presented to indicate the various markings that may be observed on glass fracture surfaces. The fact that a Griffith type equation can be used to predict the nominal stress at fracture, with the mirror being considered as the flaw, is explained, using the concepts of Irwin, by suggesting that in any one glass there is a specific strain energy release rate, $\mathcal{G}_m$, associated with the mirror boundary. (Author)

AD-414 415
Naval Ordnance Lab., White Oak, Md.
THE COMPRESSIBILITY OF PYROLYTIC GRAPHITE
N. L. Coleburn. 22 May 63, 24p
NOLTR 63-73; N63-19932
OTS repriced $0.75

DESCRIPTORS: *Pyrolytic graphite, Compressive properties, *Shock waves, Crystals, High-pressure research, Shock (Mechanics), Velocity, Sound, High-temperature research, Tables, Atmosphere entry.

The compressibility of pyrolytic graphite was dynamically measured at pressures up to 0.5 megabar by utilizing explosive-generated shock waves. Shock and free-surface velocities normal and parallel to the original plane of graphite deposition were measured optically. The Rankine-Hugoniot shock wave equations were used to determine the compression points corresponding to the measured velocities. The measurements failed to distinguish statistically between the two major crystal directions in regard to dynamic compressibility characteristics. The measured pressure-volume data for pyrolytic graphite and the results of Alder and Christian on natural graphite differ significantly at pressures above 100 kilobars. Within the range of the present experiments no transition of pyrolytic graphite to diamond was found. (Author)

MATHEMATICS

PB 163 910
Army Biological Labs., Frederick, Md.
CURVE-FITTING GUIDE
Joan C. Miller. Nov 62
Technical memo. 23
OTS $3.60

DESCRIPTORS: *Curve fitting, *Numerical methods and procedures, Functions, Transformations (Mathematics), Mathematics, Least squares method, Graphic analysis.

Various mathematical expressions that may be used to represent experimental data are presented. Specific methods of linear transformation and the general least-squares procedure for functions having nonlinear parameters are described in detail. In addition, brief discussions are given for the following classes of functions: linear combinations of exponentials asymp totic regression, frequency functions, and polynomials. References are provided that describe the methodology in greater detail. (Author)

N63-20245
Goddard Inst. for Space Studies, National Aeronautics and Space Administration, New York.
INVESTIGATION OF PROBLEMS IN THERMAL CONVECTION
J. R. Herring. 61p
Technical memo X-50227
OTS $6.60

N63-20257
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A FROBENIUS SERIES APPROACH TO THE DETERMINATION OF THE FREE SPHEROIDAL OSCILLATIONS OF A GRAVITATING SPHERE WITH A LIQUID CORE
Russell E. Carr. 15 May 63, 14p
Contract NAS7-100
Technical rept. no. 32-430
OTS $1.60

N63-23820
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PARTIAL MATHEMATICAL SOLUTION OF THE THREE-DIMENSIONAL FOUR-BAR LINKAGE
R. G. Chamberlain. 16 Sep 63, 18p
Contract NAS7-100
Technical rept. no. 32-386; NASA CR-52249
OTS $1.60

N63-23021
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THEORY OF ORBIT DETERMINATION-PART I CLASSICAL METHODS
John D. Anderson. 1 Oct 63, 10p
Contract NAS7-100
Technical report no. 32-497; NASA-CR-52021
OTS $1.10

N63-23805
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THEORY OF ORBIT DETERMINATION - PART II, ESTIMATION FORMULAS
John D. Anderson. 1 Oct 63, 11p
Contract NAS7-100
Technical rept. no. 32-498; NASA CR-52270
OTS $1.60

Computing Devices

N63-23038
Goddard Space Flight Center,. National Aeronautics and Space Administration, Greenbelt, Md.
DOCUMENTATION OF THE TIROS III DATA REDUCTION PROGRAM
Lena Fried. 18 Dec 62, 90p
X-543-62-227; NASA-TM-X-50729
OTS $8.10

AD-401 486
Lincoln Lab., Mass. Inst. of Tech., Lexington.
RADAR DATA RECORDING SYSTEM, ARBUCKLE NECK SITE, WALLOPS ISLAND, VIRGINIA
Arthur C. Dyer, David Keren, Richard MacComb, and Hans Rudolph, Jr. 23 Aug 62, 55p
Contract AF19(604)7400; ARPA Order 13
Rept. no. 312G-12; AFESD TDR-63-39
OTS $5.60

DESCRIPTORS: *Magnetic recording systems, *Recording systems, Electronic recording systems, Radar signals, Spacecraft, Multiplex, Display systems, Data processing systems, Timing devices, Cameras, Calibration, Plotters, Magnetic tape, Computers, High speed photography, Launching sites

Contents:
Data recording system
Primary recording system
Anelex system
Time system
One mile range for step calibration
Film system

PB-163 867
Research Analysis Corp., Bethesda, Md.
A COMPUTER-ASSISTED PLANNING SYSTEM
Martin W. Brossman. Dec 62, 34p
OTS $3.60

DESCRIPTORS: *Operations research, *Logistics, *Military strategy, *Data processing system, Digital computers, Programming (Computers),

The computer-assisted planning system is designed to determine future requirements for manpower and materiel and thus affects the Army's troop and materiel programs. Previous procedures utilized in determining these requirements have been time consuming, involved extensive amounts of hand computations diverting military planners from decisions, and lacked the capability to evaluate assumptions or consider alternative concepts of support. The new planning system is designed to eliminate these deficiencies and provide a more responsive planning tool to handle the wide range of contingencies which face the Army today. The paper places primary emphasis on the techniques utilized in developing the system, which included a systems analysis, a pilot study, special analytical techniques-including PERT - and concurrent computer program development and evaluation.

MECHANICS

PB-163 881
Institute of Engineering Research, Univ. of California, Berkeley.
FORCED CONVECTION HEAT TRANSFER FROM CYLINDERS AND SPHERES IN A RAREFIED GAS.
Technical rept. on Fluid Flow and Heat Transfer at Low Pressures and Temperatures
R. M. Drake, Jr., F. M. Sauer, Jr., and S. A. Schaaf. 15 Nov 50, 26p
Contract N7onr-295, Task 3
Rept. no. HE-150-74; Series no. 20, issue no. 71; ATI-95 276
OTS $2.60

DESCRIPTORS: Convection, *Heat transfer, Heat transfer coefficient, Laminar flow, *Gas flow, Cylindrical bodies, *Spheres, Superaerodynamics, Continuum mechanics, Numerical analysis,

This report introduces approximate solutions for the average heat transfer coefficients for spheres and circular cylinders for Mach and Reynolds numbers appropriate to laminar flows in the rarefied gas dynamics regime. The low density effects are accounted for by introducing velocity slip and temperature jump conditions for the flow in juxtaposition to the surface. Complexities are avoided by assumptions as to the nature of the flow field and the relative importance of the convective terms as compared with the pure conduction terms in the energy equation.

AD-278 439
Lincoln Lab., Mass. Inst. of Tech., Lexington.
LINEARIZED THEORY OF HOMOGENEOUS TURBULENCE IN A COMPRESSIBLE FLUID
A. W. Kenneth Metzner. 7 Jun 62, 43p
Contract AF19(604)7400; ARPA Order 13
Rept. no. 312G-9; ESD-TDR-62-101
OTS $4.60

DESCRIPTORS: *Compressible flow, *Turbulent flow, Fluid flow, Gases, Velocity, Viscosity, Thermal conductivity, Energy, Density, Pressure, *Equations of state, Partial differential equations, Continuum mechanics,

The Navier-Stokes equations for a perfect gas moving with constant mean velocity, including temperature dependent coefficients of first and second viscosity and thermal conductivity, and including an external force term, are linearized. Dispersion relations for the amplitudes of the fluctuating velocity, pressure and entropy are obtained. The known results on normal modes and relaxation times are rederived and discussed Turbulence spectra, previously derived only for isotropic turbulence, are derived also for axisymmetric turbulence, both in the well-known case of decay and under conditions of stationarity. It is shown that under the condition of homogeneity alone the spectra of mean kinetic energy density and viscous energy dissipation are given by two scalars, effectively the transverse and the longitudinal energy densities. (Author)

AD-414 637
Naval Ordnance Lab., White Oak, Md.
ON THE ORIGIN OF SHOCKWAVES FROM SPHERICAL CONDENSED EXPLOSIONS IN AIR. PART 1: RESULTS OF PHOTOGRAPHIC OBSERVATIONS OF PENTOLITE HEMISPHERES AT AMBIENT CONDITIONS
L. Rudlin. 9 Nov 62, 55p
NOLTR 62-182; DASA-1360
OTS repriced $1.50

DESCRIPTORS: *Shock waves, Explosions, *Detonation waves, Photographic analysis, Pentolite, Explosive materials, Detonations, Spheres, Air.

The phenomena occurring during the explosion of pentolite hemispheres are observed using the Beckman-Whitley camera operated at 0.5-upsilion second intervals. Because of the hemispherical shape, the detonation wave may be followed through the explosive and the resulting airshock followed through the air (for two charge radii). The observations indicate that the airshock formed outside the explosive results from the transmission of the detonation shock-front into the air. The airshock velocity appears to remain constant, at the detonation-velocity value of 7730 m/sec, for several microseconds before decaying in the usual airshock fashion. Comparisons of the hemispherical results are also made with previously unpublished spherical results from Naval Ordnance Laboratory (NOL) experiments and from earlier measurements. There are several discrepancies among these three sets of data revealed by the comparison but not resolved. (Author)

AD-416 165
Naval Ordnance Lab., White Oak, Md.
SHOCK WAVES, DISLOCATIONS, AND THEIR INTERACTIONS
Paul Harris and S. J. Jacobs. 4 Apr 63, 29p
NOLTR 63-94
OTS repriced $0.75

DESCRIPTORS: Solids, *Shock waves, Propagation, Dislocations, Elasticity, Plasticity, Mechanical waves, Stresses.

The existing macroscopic elastic-plastic theory is developed in a hopefully simple manner. Those aspects of the theory which are of special importance to shock propagation in solids, and which relate to the microscopic extension of the theory, are treated in length. The "hydrodynamic" equations are written in the elastic-plastic spirit and should be usable by an experimentalist regardless of the exact microscopic processes involved. A gross theory is hypothesized to account for known phenomena associated with the shock loading of solids. In particular it is put forward that dislocations are generated within the region associated with the plastic wave front with the number generated being controlled by the applied normal stress-strain law for the material in question. (Author)

Aerodynamics and Pneumatics

N63-13881
Ames Research Center, National Aeronautics and Space Administration, Moffett Field, Calif.
AERODYNAMICS OF MISSILES EMPLOYING WINGS OF VERY LOW ASPECT RATIO
Elliott D. Katzen and Leland H. Jorgensen. 5 Mar 56, 15p
Research memo no. A55L13b
OTS $1.60

NASA-MEMO-3-3-59A
Ames Research Center, National Aeronautics and Space Administration, Moffett Field, Calif.
SUBSONIC AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH A 63° SWEPTBACK WING AND TWINBOOM TAILS
Howard F. Savage and George G. Edwards. Mar 59, declassified 15 Mar 62, 57p.
OTS $1.50

NASA-TN-D-1978
Ames Research Center, National Aeronautics and Space Administration, Moffett Field, Calif.
THERMAL RADIATION FROM ABLATION PRODUCTS INJECTED INTO A HYPERSONIC SHOCK LAYER
Roger A. Craig and William C. Davey. Sep 63, 34p
N63-20608
OTS $1.00

NASA-MEMO-6-5-59A
Ames Research Center, National Aeronautics and Space Administration, Moffett Field, Calif.
WIND-TUNNEL INVESTIGATION AT SUBSONIC AND SUPERSONIC SPEEDS OF THE STATIC AND DYNAMIC STABILITY DERIVATIVES OF AN AIRPLANE MODEL WITH AN UNSWEPT WING AND A HIGH HORIZONTAL TAIL
Henry C. Lessing and James K. Butler. Jun 59, declassified 17 Jul 62. 77p
OTS $2.00

NAA-SR-MEMO-7573
Atomics International, Canoga Park, Calif.
THERMAL ANALYSIS OF R-C 13, LAUNCH PHASE
P. W. Johnson. 18 Jul 62, 50p
Contract AT(11-1)GEN-8
OTS $4.60

AD-413 165
Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
IONIZATION NONEQUILIBRIUM EFFECTS ON THE MAGNETOGASDYNAMIC INTERACTION IN THE STAGNATION REGION OF AN AXISYMMETRIC BLUNT BODY. Technical rept. 1 Mar 61-Oct 62, on Aerodynamics and Flight Mechanics
Donald W. Boyer. Sep 63, 104p
Contract AF33(616)8055
Rept. no. AG-1547-Y-1; ASD-TDR-62-1078; N63-23759
OTS repriced $2.50

DESCRIPTORS: *Blunt bodies, Hypersonic flow, *Hypersonic nozzles, Gas flow, Shock waves, Enthalpy, Gas ionization, *Magnetohydrodynamics, Magnetic fields, Stagnation point, Thermodynamics, Numerical analysis.

Exact numerical calculations have been made of the effects of finite rate chemical and ionization processes in hypersonic nozzle and axisymmetric blunt body flows pertinent to experimental magnetogasdynamic studies. The results have shown that the electrical properties of the nonequilibrium airflows are inadequate for the attainment of observable MGD effects unless very high magnetic field strengths are used. Numerical calculations of the effects of seeding such flows have shown that small amounts of seed material, insufficient to influence the gasdynamic and chemical properties of the flow, may result in the attainment of magnetic interaction parameters of significance for the perform ance of MGD experiments in hypervelocity facilities. Numerical solutions of the axisymmetric nonequilibrium MGD-shock layer interaction are described. The results were obtained by the inverse method of solution and demonstrate a significant magnetic effect in seeded airflows for moderate (2500 gauss) field strengths. The solutions indicate that both the shock stand-off distance and radius of curvature in crease with the strength of the interaction. The pressure distribution around the body increases above the Newtonian result with increase of field strength.

AD-290 725
David Taylor Model Basin, Washington, D. C.
WIND-TUNNEL INVESTIGATION OF JET BLOWING OVER A WINGLESS MISSILE BODY AT MACH NUMBERS OF 2.16, 2.48, AND 2.85
C. Carl Brindle. Sep 62, declassified 4 Dec 62, 58p
AERO rept. no. 1040; N63-11427
OTS $5.60

DESCRIPTORS: Wind tunnels, Models (Simulations), *Guided missile models, Gas flow, Jets, Aerodynamics, Feasibility studies, Lift, Drag, Guided missiles (Air to air), Control, Supersonics, Aerodynamic slots,

This report presents the results of a wind tunnel investigation to ascertain the feasibility of using asymmetric jet blowing of air over a portion of a wingless missile body to produce lift and control. Adequate lift and control forces at low angles of attack can be produced by blowing. For the use contemplated, however, the associated drag penalty would considerably reduce the flight range of the missile configurations tested. (Author)

N63-23033
Douglas Aircraft Co., Inc., Santa Monica, Calif.
WIND TUNNEL INVESTIGATION OF TURBULENT BOUNDARY LAYER NOISE AS RELATED TO DESIGN CRITERIA FOR HIGH PERFORMANCE VEHICLES
J. S. Murphy, D. A. Bies, W. V. Speaker, and P. A. Franken. Jul 63, 90p
Contract NASr-110
NASA CR-51730
OTS $8.10

PB-163 865
General Atomic Div., General Dynamics Corp. [San Diego, Calif.].
PRELIMINARY STUDY OF CONVECTIVE ABLATION
F. J. Dyson. 17 Mar 59, 9p
Contract AF18(600)1812
Rept. no. GAMD-710
OTS $1.10

DESCRIPTORS: *Ablation, Gas flow, Vaporization, Sublimation, Thermal radiation, *Aerodynamic heating

Contents:
Intuitive remarks on Helmholtz instability
Convective ablation in a quasi-static approximation
Combined effects of convection and radiation

N63-23654
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
COMPARISON OF CALCULATED WITH MEASURED BOUNDARY-LAYER THICKNESSES ON THE CURVED WALLS OF THE JPL 20-IN. SUPERSONIC WIND TUNNEL TWO-DIMENSIONAL NOZZLE.
Bain Dayman, Jr. 18 Mar 63, 29p
Contract NAS7-100
Technical rept. no. 32-349; NASA-CR-52252
OTS $2.60

NASA-TM-X-172
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
AERODYNAMIC CHARACTERISTICS AT MACH NUMBERS OF 1.41 AND 2.01 OF A SERIES OF CRANKED WINGS RANGING IN ASPECT RATIO FROM 4.00 TO 1.74 IN COMBINATION WITH A BODY
John R. Sevier, Jr. Jan 60, 6 Feb 62. 39p
OTS $1.00

NASA-TM-X-205
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
AERODYNAMIC CHARACTERISTICS OF A SPOILER-SLOT-DEFLECTOR CONTROL ON A 45° SWEPT-BACK-WING-FUSELAGE MODEL AT HIGH SUBSONIC SPEEDS
Alexander D. Hammond. Jan 60, declassified 6 Feb 62. 76p
OTS $2.00

NASA-TN-D-2038
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
EXPERIMENTAL AND CALCULATED RESULTS OF A FLUTTER INVESTIGATION OF SOME VERY LOW ASPECT-RATIO FLAT-PLATE SURFACES AT MACH NUMBERS FROM 0.62 TO 3.00
Perry W. Hanson and Gilbert M. Levey. Oct 63, 25p
Supersedes NASA TM X-53; N63-23363
OTS $0.75

NASA-TN-D-2017
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
FLIGHT TEST AND ANALYSIS OF THE ROLLING MOTIONS OF A 79° CLIPPED DELTA CONFIGURATION WITH WING-TIP FINS AT SUPERSONIC SPEEDS
James L. Raper. Nov 63, 56p
N63-23652
OTS $1.50

NASA-TN-D-1968
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
IN-FLIGHT SHOCK-WAVE PRESSURE MEASUREMENTS ABOVE AND BELOW A BOMBER AIRPLANE AT MACH NUMBERS FROM 1.42 TO 1.69
Domenic J. Maglieri, Virgil S. Ritchie, and John F. Bryant, Jr. Oct 63, 48p
N63-23125
OTS $1.25

NASA-TN-D-1962
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
SUPERSONIC INVESTIGATION OF NOZZLE HINGE MOMENTS OF A MODIFIED SATURN C - 1 MODEL WITH AND WITHOUT JET FLOW
Nickolai Charczenko and Jerry L. Lowrey, Nov 63, 45p
N63-23786
OTS $1.25

AD-283 478
Lincoln Lab., Mass. Inst. of Tech., Lexington.
REENTRY PHYSICS AND PROJECT PRESS PROGRAMS.
Semiannual technical summary rept. no. 7, 1 Jan-30 Jun 62. 30 Jun 62, 152p
Contract AF19(604)7400; ARPA Orders 12 and 166
N62-17657
OTS $11.50

DESCRIPTORS: *Re-entry aerodynamics, *Plasma physics, *Hypersonic test vehicles, Reaction kinetics, Optical tracking, Electromagnetic fields, Radar tracking, Telemetering systems, Re-entry vehicles, Wake, Gas ionization, Turbulent flow, Ablation, Data processing systems, Instrumentation, Electrons, Density, Guided missile trajectories, Atmosphere entry, Ballistic cameras.

Contents:
Laboratory experiments and analyses; flow fields and reaction kinetics; hypervelocity ballistic range experiments; electromagnetic scattering from wake plasmas; field-data analysis
The experimental program at Wallops Island: Wallops Island site operations; radar improvement program; 48-inchtracking spectrometric telescope; programming improvements of the data-processing facilities, trajectory analysis and missile dynamics; Trailblazer vehicle program;
Trailblazer II optical experiment; on board RF experiment; experiments in near-field transfer characteristics of microwave radiating elements; techniques in reentry physics instrumentation
The Press program; equipment and site; design of experiments; special studies

AD-419 647
National Aeronautical Establishment, Ottawa (Canada).
CALCULATION OF THE EQUILIBRIUM LOCATIONS OF THE VORTEX PAIR BEHIND A CIRCULAR CYLINDER WITH A SOURCE OR SINK PLACED AT THE REAR STAGNATION POINT
R. H. Wickens. Mar 63, 33p
Aeronautical rept. LR-380; N. R. C. no. 7526
OTS $3.60

DESCRIPTORS: *Fluid flow, *Vortices, Cylindrical bodies, Area suction, Stability, Velocity, Viscosity, Boundary layer, Equations, Mathematical analysis, Potential theory, Stagnation point, Fuselages

The equilibrium positions of a vortex pair of specified strength behind a circular cylinder in steady, potential flow have been calculated with a source or sink placed at the rear stagnation point. The theory indicates that a source causes the vortices to be positioned on curves which are closer to the axis of symmetry than for $C_{\mu} = 0$ and are, in general, farther downstream. A sink locates the vortices on curves which are farther away from the axis and which may be farther upstream. If the source strength increases beyond a critical value, no vortices can remain in equilibrium downstream of the cylinder. Similarly, if the suction strength exceeds 0.5, vortices are unable to be located in the flow near the cylinder. This may have some practical advantage in application to separated vortex flow over slender bodies.

Hydrodynamics, Hydraulics, and Hydrostatics

PB-163 882
David Taylor Model Basin, Washington, D. C.
AN ELECTRONIC WAVE-HEIGHT MEASURING APPARATUS
W. S. Campbell. Sep 63, 17p
Rept. 859, Revised ed.
OTS $1.60

DESCRIPTORS: *Measuring devices (Electrical and Electronic), Height finding, Water waves, Design, Operation, Effectiveness

This report describes briefly the salient features of new instrumentation for measuring and recording the wave amplitudes and wave forms of water waves. Because of the increased accuracy and flexibility afforded by the instrumentation described, it has replaced other techniques which were formerly used. This report includes schematic wiring diagrams of the instrument, its power supply, and a direct-coupled amplifier suitable for driving the recording galvanometer in a Sanborn direct-writing recorder.

NASA-TN-D-1876
Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
STUDY OF THE EFFECT OF A CLOSED-END SIDE BRANCH ON SINUSOIDALLY PERTURBED FLOW OF LIQUID IN A LINE
William Lewis, Robert J. Blade and Robert G. Dorsch. Sep 63, 20p
N63-20604
OTS $0.50

AD-405 592
National Research Council of Canada, Ottawa. Div. of Mechanical Engineering
THE HYDRODYNAMIC RESEARCH FACILITIES OF THE NATIONAL RESEARCH COUNCIL
S. T. Mathews. Mar 63, 130p
Mechanical Engineering rept. MB-251; N. R. C. no. 7361
OTS $10.10

DESCRIPTORS: *Hydrodynamics, *Physics laboratories, Ship structural components, Boats, Ships, Test equipment, Digital computers, Analog-to-digital converters, Photographs, *Test facilities,

This report describes the facilities and work of the Ship Section. It is intended to show the operation of the Section in a way which might prove useful to those who currently use the facilities or who might have future requirements. Photographs and diagrams have been used mainly for this purpose. The report may be regarded as the framework of a manual, the text being in the form of a commentary on the photographs and diagrams. (Author)

METALLURGY

AGN-8082
Aerojet-General Nucleonics, San Ramo, Calif.
RUBIDIUM/CESIUM EVALUATION PROGRAM.
Quarterly progress rept. 1 Jan-31 Mar 63.
30 Apr 63, 19p
Contract AT(04-3)368
OTS $1.60

BMI-X-226
Battelle Memorial Inst., Columbus, Ohio.
MEASUREMENT OF THE COEFFICIENT OF FRICTION BETWEEN URANIUM AND STEEL AT HIGH ALPHA-URANIUM TEMPERATURES
E. S. Hodge, R. J. Carlson, E. G. Bodine, and E. G. Smith, Jr. 9 Apr 63, 15p
Contract W7405-eng-92
OTS $1.60

AD-289 086
Illinois Inst. of Tech., Chicago.
SINGLE BOUNDARY MIGRATION IN DEFORMED CRYSTALS OF ALUMINUM. Technical rept. no. 5 and 12
B. B. Rath (Doctoral thesis) and Paul Gordon. Oct 62, 31p
Grant DA-ARO-(D)-31-124-095; Contract Nonr-1406(03)
N63-10450
OTS $3.60

DESCRIPTORS: *Aluminum, *Single crystals (Metallurgy), Metallic crystals, Deformation, Grains (Metallurgy), Copper, Theory, Zone melting,

Single boundary migration has been studied in deformed single crystals of zone-refined aluminum containing .008 and .016 wgt % copper. It was found that the boundaries could be divided into two groups-special and random--on the basis of relative crystal orientation between the recrystallizing grain and the deformed single

crystal matrix. The special boundaries exhibited higher migration rates and lower apparent activation energies for migration than did the random boundaries. Within both groups of boundaries those in the samples containing .016 wgt % copper in solution showed lower migration rates and higher apparent activation energies than those in the samples containing .008 wgt % copper. The effects of both the dissolved copper and of the relative crystal orientations on the migration rates have been rationalized on the basis of the theory first advanced by Lucke and Detert and subsequently modified and extended by Gordon and Vandermeer. (Author)

ORNL-3470
Oak Ridge National Lab., Tenn.
METALS AND CERAMICS DIVISION. Annual progress rept. for period ending 31 May 63.
1963, 282p
Contract W7405-eng-26
OTS $3.50

Nonferrous (except light) Metals

AD-411 973
Carnegie Inst. of Tech., Pittsburgh, Pa.
FACETING OF COPPER SURFACES AT 1000°C
W. M. Robertson (Doctoral thesis). [1963] 48p
Contract Nonr-760(19)
OTS $4.60

DESCRIPTORS: *Copper, Surfaces, *Annealing, *Metallic crystals, Diffusion, Nucleation, Thermodynamics, High temperature research.

Polished copper surfaces were observed to facet on annealing at 1000°C in wet hydrogen atmospheres. It was found that the quantity $\ell n\, p_{H_2O}/p_{H_2}$ must be greater than zero for extensive faceting to occur, though some faceting particularly at the facet edges, can occur for $\ell n\, p_{H_2O}/p_{H_2}$ as small as -3.5. The criteria for faceting to occur by the reduction of surface free energy are discussed and it is shown that facets near the (111) orientiation are thermodynamically stable. The effect of anisotropy of surface free energy on facet nucleation is discussed. The outlines of lens-shaped facets were measured. The observed profiles of the curved surfaces near separated linear facets are compared to theoretically calculated profiles. The observed profiles are in reasonable agreement with the calculated profiles for facet formation by surface diffusion with the surface diffusion coefficient the same on both the low index and the complex surfaces.

PB-163 908
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EVALUATION OF TUNGSTEN EXTRUSIONS PRODUCED BY THE HIGH-ENERGY-RATE EXTRUSION PROCESS
Donald P. Kohorst. 15 Jan 60, 11p
Contract NASw-6
Technical rept. no. 32-9; AD-239 418
OTS $1.60

DESCRIPTORS: *Tungsten, Rods, *Extrusion, Metallography, Hardness, Tensile properties.

An evaluation study of the high-energy-rate extrusion process, as applied to the production of small-diameter tungsten rods suitable for tensile testing, is reported. Metallographic, hardness, and tensile tests indicate that the process is satisfactory. (Author)

Structural Metallurgy and Corrosion

BMI-X-229
Battelle Memorial Inst., Columbus, Ohio.
CORROSION STUDIES IN NIOBIUM PENTAFLUORIDE
P. D. Miller, E. F. Stephan, W. N. Stiegelmeyer, and F. W. Fink. 1 May 63, 13p
Contract W7405-eng-92
OTS $1.60

ORNL-3474
Oak Ridge National Lab., Tenn.
CORROSION OF STAINLESS STEEL IN ACIDIC NITRATE WASTE SOLUTIONS FROM PROCESSING STAINLESS STEEL REACTOR FUELS
D. N. Hess, L. Rice, B. Willis, E. S. Snavely, and W. E. Clark. 1963, 30p
Contract W7405-eng-26
OTS $0.75

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

BNL-6931
Brookhaven National Lab., Upton, N. Y.
OPTICAL MODEL ANALYSIS OF HEAVY ION SCATTERING
E. H. Auerbach and C. E. Porter. 8 May 63, 21p
Contract AT(30-2)GEN-16
OTS $2.60

BNL-6912
Brookhaven National Lab., Upton, N. Y.
THE USE OF COLOR CENTERS FOR THE DETECTION AND MEASUREMENT OF RADIATION INDUCED DEFECTS
Paul W. Levy. 29 Apr 63, 31p
Contract AT(30-2)GEN-16
OTS $3.60

AD-405 804
Gates and Crellin Labs. of Chemistry, Calif. Inst. of Tech., Pasadena.
THE CONFIGURATIONAL STABILITY OF PRIMARY GRIGNARD REAGENTS. Technical rept. no. 22
George M. Whitesides, Fred Kaplan, and John D. Roberts. May 63, 8p
Contract Nonr-220(26)
OTS $1.10

DESCRIPTORS: *Grignard reagents, Molecular structure, *Metalorganic compounds, Alkyl radicals, *Magnesium compounds, Halides, Nuclear magnetic resonance.

The n. m. r. spectrum of the methylene hydrogen 3, 3-dimethylbutylmagnesium chloride in diethyl ether solution changes from an A_2X_2-type spectrum at $+33^{\circ}$ to an AA'XX'-type at $-50^{\circ}3$. The observation of two distinct vicinal coupling constants at low temperatures indicates that inversion of configuration at the $-CH_2-Mg$ center is slow on the n. m. r. time scale, and strongly suggests that the populations of the three conformations are not equal.

IITRI-1194-13
IIT Research Inst., Chicago, Ill.
LITERATURE SURVEY ON WORLD ISOTOPE AND RADIATION TECHNOLOGY. Final rept. for 15 Jun 61-14 Jun 62.
J. W. Haffner. 15 Sep 63, 72p
Contract AT(11-1)578
OTS $1.75

TID-18429
Michigan Univ. Ann Arbor.
SLOW NEUTRON SCATTERING, THE "SCATTERING LAW," AND G(r, t)
G. C. Summerfield and P. F. Zweifel. 15 Apr 63, 13p
Contract AT(11-1)917
OTS $1.60

IDO-14610
Phillips Petroleum Co., Idaho Falls.
CONCEPTUAL STUDY OF A SYSTEM FOR RADIOACTIVE DEMONSTRATION OF THE CHOP-LEACH PROCESS. Terminal rept.
J. A. Buckham, R. S. P'Pool, and R. G. Pitkin.
9 Aug 63, 86p Prepared in cooperation with Vitro Engineering Co.
Contract AT(10-1)205
OTS $2.00

Instruments and Installations

TID-13798
Argonne National Lab., Ill.
DESIGN CHARACTERISTICS OF BEAM CURRENT MONITORS, PART II.
M. E. Abdelaziz. 24 Jul 61, 31p
Contract W31-109-eng-38
OTS $1.60

NAA-SR-MEMO-4365
Atomics International, Canoga Park, Calif.
FAST NEUTRON FLUX MEASUREMENTS FOR SHIELDING APPLICATIONS
M. Roy. 27 Aug 59, 5p
Contract AT(11-1)GEN-8
OTS $1.10

HW-76944
Hanford Atomic Products Operation, Richland, Wash.
THE NEW HANFORD FILM BADGE DOSIMETER
L. F. Kocher, P. E. Bramson, and C. M. Unruh.
1 Mar 63, 25p
Contract AT(45-1)1350
OTS $2.60

TID-18560
Rauland Corp., Chicago, Ill.
IMAGE TUBE DESIGN. Final rept.
G. Francis and W. F. Niklas. 19 Mar 63, 26p
Contract AT(11-1)1058
OTS $2.60

Nuclear Engineering

AGN-TM-404
Aerojet-General Nucleonics, San Ramon, Calif.
ARMY GAS-COOLED REACTOR SYSTEMS PROGRAM. DEFECTIVE FUEL ELEMENT TESTING FOR THE ML-1.
Howard S. Dreyer. Sept 63, 62p
Contract AT(10-1)880
OTS $1.50

IDO-28598
Aerojet-General Nucleonics, San Ramon, Calif.
ARMY GAS-COOLED REACTOR SYSTEMS PROGRAM. GAS-COOLED REACTOR EXPERIMENT-I. Final summary rept. Oct 63, 194p
Contract AT(10-1)880
OTS $3.00

ACNP-63003
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
HIGHLY SELF-SHIELDED BURNABLE POISONS
R. J. Holl. 6 Mar 63, 134p
Contract AT(11-1)589
OTS $10.50

ACNP-63002
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
PRESSURE DROP AND VOID FRACTION EXPERIMENTS IN SIMULATED PATHFINDER BOILER FUEL ELEMENTS
G. Kangas and K. Neusen. 8 Mar 63, 93p
Contract AT(11-1)589
OTS $8.60

ANL-6801
Argonne National Lab., Ill.
REACTOR DEVELOPMENT PROGRAM. Progress rept. for Oct 63. 15 Nov 63, 84p
Contract W31-109-eng-38
OTS $2.00

TID-7648(Pt. 1)
Atomic Energy of Canada, Ltd.
THE TRIPARTITE ORGANIC COOLED HEAVY WATER REACTOR MEETING, SANTA MONICA, CALIFORNIA, JUNE 11-13, 1962 1963, 242p
OTS $3.00

IDO-24042
Babcock and Wilcox Co., Lynchburg, Va.
DESIGN CRITERIA FOR A THERMAL FLUX LIQUID METAL PACKAGE LOOP IN THE ADVANCED TEST REACTOR. Summary rept. Mar 63, 166p Prepared in cooperation with Ebasco Services, Inc.
Contract AT(10-1)1075
OTS $2.75

IDO-24041
Babcock and Wilcox Co., Lynchburg, Va.
DESIGN CRITERIA FOR FAST FLUX LIQUID METAL LOOP IN THE ADVANCED TEST REACTOR Jul 62, 212p Prepared in cooperation with Ebasco Services, Inc.
Contract AT(10-1)1075
OTS $3.00

BAW-1273
Babcock and Wilcox Co., Lynchburg, Va.
SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM. MEASUREMENT AND ANALYSIS OF UNIFORM LATTICES OF SLIGHTLY ENRICHED UO_2 MODERATED BY D_2O-H_2O MIXTURES
T. C. Engelder, R. H. Clark, M. N. Baldwin, E. J. DeRoche, and G. T. Fairburn. Nov 63, 152p.
Contract AT(30-1)2602
OTS $2.75

WAPD-TM-313
Bettis Atomic Power Lab., Pittsburgh, Pa.
THE EVOLUTION OF XENON-133 FROM SLIGHTLY IRRADIATED ZIRCONIA-URANIA PLATES
J. C. Clayton. Aug 63, 24p
Contract AT(11-1)GEN-14
OTS $0.50

WAPD-MRP-105
Bettis Atomic Power Lab., Pittsburgh, Pa.
PRESSURIZED WATER REACTOR (PWR) PROJECT. Technical progress rept. for 24 Jan-23 Aug 63. 1963. 138p
Contract AT(11-1)GEN-14
OTS $2.50

TID-18512
Engineering Research Labs., Columbia Univ., New York.
BASIC EXPERIMENTAL STUDIES OF BOILING FLUID FLOW AND HEAT TRANSFER AT ELEVATED PRESSURES. Monthly progress rept. for Mar 63
Bruce Matzner. 29 Mar 63, 10p
Contract AT(30-3)187
OTS $1.10

GAMD-2100 (Rev.)
General Atomic Div., General Dynamics Corp., San Diego, Calif.
THE 40 Mw HTGR CONTROL ROD DRIVE
A. Harris and E. Ledin. Mar 53, 50p
Contract AT(04-3)314
OTS $4.60

GA-2372
General Atomic Div., General Dynamics Corp., San Diego, Calif.
MARITIME GAS-COOLED REACTOR PROGRAM. Quarterly progress rept. for the period ending 30 June 61. 31 Jul 63, 136p Prepared in cooperation with Electric Boat Div., General Dynamics Corp.
Contract AT(04-3)187
OTS $2.50

GA-2568
General Atomic Div., General Dynamics Corp., San Diego, Calif.
MARITIME GAS-COOLED REACTOR PROGRAM. Quarterly progress rept. for period ending 30 Sep 61. 17 May 63, 137p
Contract AT(04-3)187
OTS $10.50

GEAP-3771-6
General Electric Co., San Jose, Calif.
HIGH PERFORMANCE UO_2 PROGRAM. Quarterly progress rept. no. 6, Jul-Sep 62.
B. Weidenbaum. 6 May 63, 88p
Contract AT(04-3)189
EURAEC-503
OTS $8.10

HW-73693
Hanford Atomic Products Operation, Richland, Wash.
GENERAL DESCRIPTION OF THE HIGH TEMPERATURE LATTICE TEST REACTOR
D. E. Wood. 19 Jul 62, 4p
Contract AT(45-1)1350
OTS $1.10

HW-76182
Hanford Atomic Products Operation, Richland, Wash.
PRTR FUEL ELEMENT EXTRACTOR
M. E. Shockley. 15 Jan 63, 15p
Contract AT(45-1)1350
OTS $1.60

HW-67418
Hanford Atomic Products Operation, Richland, Wash.
REACTOR CONFINEMENT PROJECT CGI-791 OPERATING MANUAL; 100-K
D. E. Newby and C. E. Jones. 30 Dec 60, 57p
Contract AT(45-1)1350
OTS $5.60

TID-7024
Lockheed Aircraft Corp., Burbank, Calif.
NUCLEAR REACTORS AND EARTHQUAKES
T. H. Thomas, G. Yasiu, R. H. Graham, R. A. Williamson, and R. E. Lowe. Aug 63, 426p Prepared in cooperation with Holmes and Narver, Inc.
OTS $5.00

LADC-5719
Los Alamos Scientific Lab., N. Mex.
MULTIPLE CASTING OF FUEL PINS FOR THE LOS ALAMOS MOLTEN PLUTONIUM REACTOR EXPERIMENT
J. W. Anderson and W. J. Maraman. 13 May 63, 24p
Contract W7405-eng-36
OTS $2.60

PB-163 891
Martin-[Marietta Corp.] Baltimore, Md.
CORE EXTRAPOLATION EXPERIMENTS
J. F. O'Brien. Sep 59, 47p
Contract DA44-009-eng-3318
Rept. no. MND-E-2132; AD-228 157
OTS $4.60

DESCRIPTORS: *Pressurized water reactors, *Reactor cores, Reactor fuel cladding, Stainless steel, *Boron, *Critical assemblies, *Control rods, Calibration, *Reactor fuels, *Temperature coefficient of reactivity.

The results of the first doubly-loaded APPR core critical experiment were presented and analyzed. Critical size, fuel and boron worth and temperature coefficient were considered. (Author)

ORNL-3476
Oak Ridge National Lab., Tenn.
AN EVALUATION OF THE SUBSTITUTION OF ZIRCALOY FOR STAINLESS STEEL IN N. S. SAVANNAH FUEL-ELEMENT CONTAINERS. Summary rept.
T. D. Anderson, E. E. Gross, H. C. McCurdy, L. D. Schaffer, and L. R. Shobe. 1963, 77p
Contract W7405-eng-26
OTS $2.00

ORNL-3458
Oak Ridge National Lab., Tenn.
SPECIFICATIONS AND PROCEDURES USED IN MANUFACTURING U_3O_8-ALUMINUM DISPERSION FUEL ELEMENTS FOR CORE I OF THE PUERTO RICO RESEARCH REACTOR
W. J. Kucera, C. F. Leitten, Jr., and R. J. Beaver. 1963, 66p
Contract W7405-eng-26
OTS $1.75

ORNL-3385
Oak Ridge National Lab., Tenn.
THORIUM FUEL CYCLE DEVELOPMENT. Status and progress rept. for period ending 31 Dec 62.
D. E. Ferguson. comp. 1963, 143p
Contract W7405-eng-26
OTS $2.50

ORNL-3482
Oak Ridge National Lab., Tenn.
TRANSURANIUM. Quarterly progress rept. for period ending 28 Feb 63.
W. D. Burch, comp. 1963, 65p
Contract W7405-eng-26
OTS $1.75

SRO-82
Savannah River Operations Office, Atomic Energy Commision, Augusta, Ga.
HEAVY WATER POWER REACTOR PROGRAM. Monthly progress rept. for Apr 63.
1963, 12p
OTS $1.60

TID-18568
Southwest Research Inst., San Antonio, Tex.
ELK RIVER REACTOR VESSEL LIFETIME CYCLIC TEST PROGRAM. Progress rept. no. 1.
Clarence E. Lautzenheiser, Alfred L. Lowenberg, and Allen R. Whiting. 18 Apr 63, 69p
Contract AT(11-1)1228
OTS $6.60

TID-17005
Space Technology Labs., Inc., Canoga Park, Calif.
KINETIC STUDIES OF HETEROGENEOUS WATER REACTOR. Quarterly progress rept. no. 21, for period ending 30 Sep 62.
W. W. Brown, L. Wentz, R. W. Wright, G. C. K. Yeh, and S. M. Zivi. 11 Oct 62, 47p
Contract AT(04-3)372
OTS $4.60

STL-6212
Space Technology Labs., Inc., Redondo Beach, Calif.
KINETIC STUDIES OF HETEROGENEOUS WATER REACTORS. Annual summary rept. for 1962.
30 Dec 62, 134p
Contract AT(04-3)372
OTS $2.50

GEAP-4201
Vallecitos Atomic Lab., General Electric Co., San Jose, Calif.
ACCURATE NUCLEAR FUEL BURNUP ANALYSES. Quarterly progress rept. no. 5, Dec 62-Feb 63.
B. F. Rider, C. P. Ruiz, and J. P. Peterson, Jr.
1 Mar 63, 32p
Contract AT(04-3)189
OTS $3.60

CVNA-184
Westinghouse Electric Corp., Pittsburgh, Pa.
CAROLINAS VIRGINIA TUBE REACTOR. LARGE PLANT STUDY.
R. G. McGrath, ed. Jun 63, 100p
OTS $2.25

Radioactivity

CEX-61.6.3
Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.
CAMDEN; DELAWARE VALLEY AREA (ARMS-II)
R. B. Guillou. 10 Nov 61, 20p
OTS $0.50

CEX-61.6.1
Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.
LAS VEGAS AREA (ARMS-II)
R. B. Guillou, J. E. Hand, and H. M. Borella.
Oct 61, 21p
OTS $0.50

NP-12392
European Co. for the Chemical Processing of Irradiated Fuels, Mol (Belgium).
THE RELATION BETWEEN THE RADIOACTIVE FALL-OUT IN AIR AND RAIN
H. H. P. Moeken and J. J. H. Alderhout. 9 Feb 61, 14p
Eurochemic technical rept. no. 100
OTS $1.60

Waste Disposal

IDO-12027
Idaho Operations Office, Atomic Energy Commission, Idaho Falls.
A COMPARISON OF TWO METHODS OF SAMPLING GRAVEL FOR THE EVALUATION OF A GROUND-DISPOSAL SITE FOR RADIOACTIVE LIQUID WASTE
D. B. Hawkins and D. C. Foster. Mar 63, 20p
OTS $1.60

ORNL-3355
Oak Ridge National Lab., Tenn.
EVALUATION OF ULTIMATE DISPOSAL METHODS FOR LIQUID AND SOLID RADIOACTIVE WASTES. PART III. INTERIM STORAGE OF SOLIDIFIED WASTES.
J. O. Blomeke, J. J. Perona, H. O. Weeren, and R. L. Bradshaw. 1963, 42p
Contract W7405-eng-26
OTS $1.25

ORNL-2611
Oak Ridge National Lab., Tenn.
FIXATION OF FISSION PRODUCTS IN ALUMINUM NITRATE WASTES BY CERAMIC MASSES
1959, 26p
Contract W7405-eng-26
OTS $0.75

PHYSICS

AD-405 492
Avco Everett Research Lab., Mass.
ELECTROSTATIC ACCELERATION OF NEUTRAL PLASMAS - MOMENTUM TRANSFER THROUGH MAGNETIC FIELDS
G. S. Janes, J. Dotson, and T. Wilson. Sep 62, 29p
Contract AF49(638)659
Research rept. 150; supersedes AMP-88, AFOSR-3887, NP-12154, N62-16771, AD-294 142
OTS $2.60

DESCRIPTORS: *Electric propulsion, Plasma engines, *Plasma physics, *Ions, Acceleration, *Electrostatics, Electric fields, Magnetic fields, Electrons, Diffusion,

Electrostatic plasma accelerators which avoid the space charge limitations of conventional ion rockets are described. Additional advantages for these devices include moderate requirements on magnetic field strength, and on power level. In cylindrical and annular geometries, neutral plasmas can exhibit axial acceleration under the influence of externally applied axial electrostatic fields in the presence of radial magnetic fields. Ions will accelerate freely in the presence of such an axial electric field if both the ion gyro radius and the ion mean free path are large relative to the apparatus size. A critical engineering question concerns the effectiveness of the radial magnetic field in inhibiting the upstream diffusion of electrons. This diffusion is an energy loss mechanism. Both classical and anomalous (Bohm type) electron diffusion models are considered. Experiments are described which substantiate the existence of the here des cribed mechanism for momentum transfer to neutral plasmas. The experiments are in approximate agreement with the anomalous (Bohm type) diffusion model and are in clear disagreement with the classical diffusion model. The engineering significance of this result and possible approaches for dealing with it are considered. (Author)

AD-283 563
Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOURCES OF ERROR IN MICROWAVE TRANSMISSION MEASUREMENT OF IONIZED TRAILS
Charles Bressel and Gary H. Price. 3 July 62, 80p
Contract AF19(628)500; ARPA Order 13
Rept. no. 312G-10
OTS $7.60

DESCRIPTORS: *Hypervelocity projectiles, *Gas ionization, *Microwaves, *Wave transmission, Reflection, Measurement, Noise, Errors,

This report summarizes investigations performed in the period June-Aug 61 to determine the error present in the determination of electron distribution in the trail of a pellet by means of microwave transmission and reflection measurements. In the specific experiment investigated S-band microwave transmission and reflection measurements are being used, in conjunction with other measurements, to investigate the trail produced by pellets traveling at velocities of 15,000 to 20,000 ft/sec in air at pressures of 1 to 20 millimeters of Mercury in most shots. An error range of from ± 30% to 1 order of magnitude in electron density and from ± 10% to a factor of 2 in trail diameter was found for shots fired after 12 July 1961. For earlier shots errors are larger. (Author)

AD-403 511
National Research Council of Canada, Ottawa. Div. of Mechanical Engineering
TABLES OF REACTANCE INTEGRALS RELATING TO THE EDDY CURRENT CONDUCTIVITY PROBE
F. T. Stock and D. C. Baxter. Jan 63, 45p
Mechanical Engineering rept. MK-11; N. R. C. no. 7290
OTS $4.60

DESCRIPTORS: *Magnetohydrodynamics, *Shock waves, *Electrical conductance, Fluid flow, Velocity, Geometric forms, *Probes (Electromagnetic), *Integrals, Tables.

Tables of the inductance and loss resistance change in a single-turn coil carrying an electrical current and surrounding a cylindrical tube in which is flowing an electrically conducting fluid are presented. These properties are a function of geometry, fluid velocity, electrical properties of the fluid and electrical frequency. (Author)

Electricity and Magnetism

BNL-6906
Brookhaven National Lab., Upton, N. Y.
HALL PROBE REGULATION OF EXPERIMENTAL POWER SUPPLIES
G. S. Levine. 4 Apr 62, 4p
Contract AT(30-2)GEN-16
OTS $1.10

AD-290 232
Stanford Electronics Labs., Stanford Univ., Calif.
A BAYARD TYPE NONRECIPROCAL n-PORT SYNTHESIS
Robert W. Newcomb. Sep 62, 19p
Grant NSF G-18945
Technical rept. no. 2254-2; SEL-62-112
OTS $1.60

DESCRIPTORS: *Electrical impedance, *Matrix algebra, *Microwave networks, Antennas, Complex variables, Transmission lines, Synthesis, *Circuits,

The impedance synthesis of Bayard
In two ways is extended by this bard,
With the verification for n-ports
Of finite and non-reciprocal sorts.
All computations are of simplest kind,
While equivalents, we show how to find. (Author)

AD-290 095
Stanford Electronics Labs., Stanford Univ., Calif.
NONRECIPROCAL TRANSMISSION-LINE n-PORT SYNTHESIS
Robert W. Newcomb. Sep 62, 21p
Grant NSF G-18945
Technical rept. no. 2254-3; SEL-62-115
OTS $2.60

DESCRIPTORS: *Transmission lines, *Circuits, Electrical impedance, Synthesis, Matrix algebra, Functions, Taylor's series, Transformations (Mathematics),

Richards' theorem imparts its strength,
Using lines of integral length,
To realizations, type non-rational,
Of n-port circuits, non-reciprocal.
One-way transmission filter exampled
Details much of the theory included. (Author)

AD-290 233
Stanford Electronics Labs., Stanford Univ., Calif.
RICHARDS' THEOREM FOR MATRICES
Robert W. Newcomb. Jul 62, 16p
Grant NSF G-2254-1
Technical rept. no. 2254-1; SEL-62-110
OTS $1.60

DESCRIPTORS: *Electrical networks, *Electrical impedance, *Resistance (Electrical), *Matrix algebra, *Transmission lines, Electricity, Synthesis, Theory,

Extensions, complete in final form,
Conclude the theorem by Richards born.
Included scattering proof satisfactional,
Embraces matrices, skew and irrational. (Author)

Electronics

AD-413 482
Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPTIMUM JAMMING OF INCOHERENTLY RECEIVED FSK SIGNALS
Leo I. Bluestein. 26 Jun 63, 28p
Contract AF19(628)500
Rept. no. 65G-2; AFESD TDR-63-89
OTS $2.60

DESCRIPTORS: *Pulse communication systems, *Radio jamming, *Frequency shift keyers, Radio signals, Game theory, Noise (Radio), Signal-to-noise ratio, Digital systems, Optimization.

This report finds the optimum jamming strategy against a binary communication system in which the two time-limited signals occupy separate frequency bands, and the receiver is ignorant of the RF phase of the signal. The jammer has at his disposal power-limited Gaussian noise; under this constraint the noise may have any spectral density function. Consistent with game-theoretic notions, it is assumed that the receiver possesses a full knowledge of the spectral density function chosen by the jammer and hence is constructed accordingly (i.e., in an optimum fashion). A quantity analogous to distance is then defined; it is this quantity which the jammer seeks to minimize.

AD-413 786
Lincoln Lab., Mass. Inst. of Tech., Lexington
A REAL-TIME FOURIER TRANSFORMER
W. E. Morrow, Jr., J. Max, J. Perticeks, and D. Karp. 16 Jul 63, 26p
Contract AF19(628)500
Rept. no. 36G-4; AFESD TDR-63-96
OTS $2.60

DESCRIPTORS: *Spectrum analyzers, Fourier analysis, Signals, Real time, Mixers (Electronic), Bandpass filters, Frequency modulation, Integral transforms, Frequency analyzers, Waveform generators.

A new technique is described which allows the Fourier transformation of a signal to be taken in real time. This technique makes use of signals and networks having linear frequency modulation properties. Its salient features are that the bandwidth of the signal being transformed is increased by no more than a factor of two during processing and that both the real and imaginary parts of the Fourier transform are obtained. An experimental demonstration of the method is included. (Author)

AD-294 647
Lincoln Lab., Mass. Inst. of Tech., Lexington.
SCATTERING FROM A RADIALLY VARYING PLASMA CYLINDER OF INFINITE LENGTH
C. M. de Ridder and L. G. Peterson. 4 Dec 62, 89p
Contract AF19(628)500; ARPA Order 13
Rept. no. 312G-8; AFESD TDR-62-261
OTS $8.10

DESCRIPTORS: *Electron diffraction analysis, *Plasma physics, *Scattering, Partial differential equations, Cylindrical bodies, Density, Frequency, Wave characteristics, Polorization.

Assuming broadside incidence of a plane wave polarized parallel to the axis of an infinitely long plasma cylinder, reflection and transmission coefficients and their phases are calculated by an exact solution of Maxwell's equations for three distinct monotonic radial electron density distributions. Two collision frequencies are used, and the cylinder radius is varied from 0.05 to 4 wavelengths. The results are presented as a set of curves in which the scattering parameters are plotted versus the plasma frequency on the axis of the cylinder, normalized with respect to the frequency of the incident wave. For comparison a set of curves covering the same range of parameters for a homogeneous plasma cylinder is also included. (Author)

MATT-77
Plasma Physics Lab., Princeton Univ., N. J.
THE SHEATH CRITERION
Francis F. Chen. 13 Jun 61, 15p
Contract AT(30-1)1238
OTS $1.60

NASA-TN-D-2226
. Rennselaer Polytechnic Inst. Troy, N. Y.
INVESTIGATION OF PLASMA AFTERGLOWS WITH APPLICATION IN NITROGEN
K. C. Stotz. Nov 63, 100p
Grant NsG-48-60
N63-23653
OTS $2.25

Molecular Physics and Spectroscopy

AD-291 408
Avco Everett Research Lab., Mass.
SHOCK TUBE STUDY OF THE RECOMBINATION OF O-ATOMS BY Ar CATALYSTS AT HIGH TEMPERATURES
Kurt L. Wray. Sep 62, 27p
Contract DA19-020-ORD-5476
Research rept. 142; N63-10887
OTS $2.60

DESCRIPTORS: *Recombination reactions, *Oxygen, *Shock tubes, Atoms, Catalysts, Argon, High temperature research, Chemical reactions, Gases, Shock waves, Dissociation, Theory, Absorption

The three-body recombination of O-atoms by Ar catalysts was measured over a temperature range of 1340-2920°K in a shock tube experiment. The excess amount of O-atoms was produced by shocking dilute O_3-Ar mixtures. Under the experimental conditions, the O-atoms in excess of equilibrium produced by the reaction $O_3 + M \rightarrow O + O_2 + M$ had to recombine via the reaction $O + O + M \rightarrow O_2 + M$. The reaction $O_3 + O \rightarrow 2O_2$ was ineffective due to the high temperature and high concentration of Ar. The O_2 formed by the recombination of the O-atoms was monitored behind the shock wave by absorption of 1270A radiation. The data scatter by about a factor of two, but a slight negative temperature dependence is apparent. At 2000°K the recombination coefficient is about 0.7×10^{-34} cm^6/$particle^2$-sec. The experimental results are compared with calculated curves based on various authors' dissociation rate constants divided by the equilibrium constant.

AD-296 124
Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE SPECTRA OF THE RADIATION FROM THE TRAIL OF HYPERVELOCITY SPHERES IN ARGON
B. W. Bryant, 11 Dec 62, 20p
Contract AF19(628)500; ARPA Order 13
Technical rept. no. 290; AFESD TDR-62-270
OTS $1.60

DESCRIPTORS: *Hyperveolicty projectiles, *Line spectrum, Spheres, Argon, Aluminum, Spectroscopy, Spectra (Infrared), Spectra (Visible and ultraviolet), Atomic spectroscopy, Ablation, Temperature, Shock waves, Thermodynamics, Entropy, Gas flow, Intensity.

The spectra of the radiation emitted from hypervelocity aluminum spheres in argon have shown that the ablation materials are the prominent emitters. The relative intensities of the AlI lines at 3090 and 3954°A indicate a wake temperature between 3000° and 4000°K, and a stagnation temperature of about 8350°K. These temperatures are somewhat higher than those calculated from the Rankine-Hugoniot equations for strong shocks, assuming ideal gas equilibrium conditions. The indications are that self-absorption of the radiation may not be negligible. (Author)

Solid State Physics

HW-75148
Hanford Atomic Products Operation, Richland, Wash.
THERMAL EXPANSION AND CHANGE IN VOLUME ON MELTING FOR URANIUM DIOXIDE
J. A. Christensen. 4 Oct 62, 9p
Contract AT(45-1)1350
OTS $0.50

AD-400 709
Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH 1962, NO. 4. 7 Mar 63, 93p
Contract AF19(628)500
AFESD-TDR-63-30
OTS $8.60

DESCRIPTORS: *Solid state physics, *Scientific research, Semiconductor devices, Chemistry, Semiconductors, Spectroscopy, Electron transitions, Magnetic materials, Rare earths, Films, Masers, Optics, Reports.

Contents:
Solid state device design
Chemistry
Materials research
Band structure and spectroscopy of solids
Spectroscopy of magnetic solids
Transition metal and rare-earth compounds
Physics of films
Optics and infrared

NCSC-2663-11
North Carolina State Coll., Raleigh.
URANIUM INTERSTITIAL PHASES. Quarterly progress rept.
Robert F. Stoops and John V. Hamme. Mar 63, 17p
Contract AT(40-1)2663
OTS $1.60

AD-408 698
Westinghouse Research Labs., Pittsburgh, Pa.
TRANSPORT STUDIES OF DEFECT STRUCTURE INORGANIC COMPOUNDS. Semiannual technical rept., 1 Oct 62-31 Mar 63
R. R. Heikes. [1963] 110p
Contract Nonr-3800(00); ARPA Order no. 300-62
NP-12969
OTS $9.10

DESCRIPTORS: *Semiconductors, *Crystal lattice defects, Transport properties, *Thorium compounds, *Yttrium compounds, Oxides, Crystal lattices, Electrical conductance, *Zirconium compounds, *Calcium compounds, Fluorspar, Phase studies, X-ray diffraction analysis, *Ionic current, *Cadmium compounds, *Lead compounds, *Niobium compounds, Minerals, *Thermoelectricity,

Contents:
System ThO_2-Y_2O_3 by E. C. Subbarao and P. H. Sutter
Fluorite phase in the system ZrO_2-CaO: X-ray and electrical conductivity study by T. Y. Tien and E. C. Subbaroa
Order-disorder and ionic conductivity in cubic ZrO_2-CaO by E. C. Subbarao and P. H. Sutter
Conduction properties of $Cd_2Nb_2O_7$ AND $Pb_{1.5}Nb_2O_{6.5}$ by R. Mazelsky and W. E. Kramer

A study of transport properties of mixed-valence semiconductors by R. R. Heikes, A. A. Maradudin, and R. C. Miller. Scientific paper 62-529-P1 (in French) (See also AD-290 362)

Theoretical Physics

NASA-TN-D-1985
Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
RECIPROCITY IN QUANTUM MECHANICS
D. E. Bilhorn, L. L. Foldy, V. A. Madsen, R. M. Thaler, and W. Tobocman. Aug 63, 24p
N63-20347
OTS $0.75

NASA-TN-D-1111
Marshall Space Flight Center, National Aeronautics and Space Administration, Huntsville, Ala.
A MATHEMATICAL TREATMENT OF THE PROBLEM OF DETERMINING THE EIGENVALUES ASSOCIATED WITH A PARTITION FUNCTION OF AN ATOM IN THE INTERIOR OF A PLASMA
E. Baylis Shanks. Oct 63, 11p
N63-23122
OTS $0.50

Thermodynamics

AD-274 352
Advanced Technology Labs., Mountain View, Calif.
DUAL PROBE FOR HIGH-TEMPERATURE-GAS MEASUREMENTS. Final rept. Jan-May 61, on Research on a Novel Technique of Measuring Very High Gas Temperatures
M. L. Temme and W. H. Giedt. Dec 61, 53p
Contract AF33(616)7805
ARL 174
OTS $5.00

DESCRIPTORS: *Temperature sensitive elements, *Thermocouples, *Gas flow, Temperature, Measurement, *High temperature research.

The results of an analytical and experimental investigation of a novel system based on a dual-probe principle for measuring very high and rapidly fluctuating temperatures in gas streams are given. The analysis demonstrates that indications within accuracies of at least +20%, and possibly +6%, are attainable in a gas stream at 4900°F with a velocity corresponding to a Mach number of 0.5, and probably also in higher temperature streams. A dual probe tested in a gas stream at about 1500°F with 100-ft/sec velocity gave a temperature indication within 10% of a conventionally obtained measurement. Because successful utilization of the dual-probe technique is dependent on the precision with which the unit is calibrated and measurements are taken, further experimental effort, guided by critical analysis, is recommended. (Author)

IS-645
Institute for Atomic Research, Iowa State Univ. of Science and Tech.
MEASUREMENT OF THERMAL PROPERTIES BY THE ARC IMAGE FURNACE
W. R. McMahon and D. R. Wilder. 16 Apr 63, 20p
Contract W7405-eng-82
OTS $1.60

NASA-SP-3001
Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
THERMODYNAMIC PROPERTIES TO 6000°K FOR 210 SUBSTANCES INVOLVING THE FIRST 18 ELEMENTS
Bonnie J. McBride, Sheldon Heimel, Janet G. Ehlers, and Sanford Gordon. 1963, 332p
N63-23715
OTS $5.00

AD-294 645
Lincoln Lab., Mass. Inst. of Tech., Lexington.
CALCULATION OF THE SURFACE TEMPERATURE OF A SOLID UNDER ELECTRON BOMBARDMENT
G. E. Vibrans. 16 Nov 62, 21p
Contract AF19(628)500; ARPA Order 85
Technical rept. no. 268; AFESD TDR-62-263
OTS $2.60

DESCRIPTORS: *Surface temperatures, *Solids, Thermodynamics, *Electron bombardment, Heat transfer, Equations, Numerical analysis

The temperature on the surface of any solid under electron bombardment can be calculated by classical means if the thermal properties and the energy dissipation within the range of the electrons are known. Two different dissipation functions have been assumed, both of which have some theoretical justification. The surface temperature computed with these two assumptions is compared in two normalized diagrams. The first dissipation function is derived from range measurement, while the second is taken from the computations of L. V. Spencer. The method of heat flow computation is explained and it is shown that any new solid or any better value of thermal properties can be introduced by using two new scaling factors. (Author)

AD-278 681
London Univ. (England).
AN EXPERIMENTAL STUDY OF BURNER STABILIZED TURBULENT FLAMES IN PREMIXED REACTANTS. Final technical rept. on Research in Chemical Energetics
M. D. Fox and F. J. Weinberg. Apr 62, 40p
Contract AF61(514)1013
ARL 62-337; N62-14321
OTS $3.60

DESCRIPTORS: *Flame propagation, *Turbulence, *Burning rate, Measurement, Photographic analysis.

Current concepts of flame propagation in premixed, turbulent gas streams are examined. This leads to the conclusion that the link between theory and experiment is entirely inadequate and incapable of improvement by existing methods. A series of new methods is implemented in an attempt to short-circuit the unprofitable chain of hypothesis and experiment which has hampered the identification of dubious steps. Methods of introducing uniform turbulence at relatively slow flows and improvements in light sources allow analysis of the approach flow by photographing particles illuminated by an interrupted Tyndall beam. Three new optical deflection method are used to give a measure of the randomness of flame-front orientation, of the time-mean structure of the flame and of the instantaneous shape of the corrugated front. It is found that this

corrugated surface propagates at a velocity considerably in excess of the normal laminar burning velocity. Quantitative analysis of the frequency of "peaks" and "valleys" on the surface, together with comparative data from the apex of laminar flames, suggests an explanation in terms of the effects of curvature and, secondarily, of the influence of small scale turbulence. (Author)

AD-405 690
National Aeronautical Establishment, Ottawa (Canada).
FURTHER COMMENTS ON ANALOGUE NETWORKS TO OBTAIN HEAT FLUX FROM SURFACE TEMPERATURE MEASUREMENTS
R. F. Meyer. Mar 63, 39p
Aeronautical rept. LR-375; N.R.C. no. 7363
OTS $3.60

DESCRIPTORS: *Heat transfer, Temperature, Measurement, *Analog systems, Shock tubes, Wind tunnels, Temperature, Sensitive elements, Thin films,

Two electrical analogues which convert surface temperature measurements directly to heat flux, one due to G. T. Skinner and the other to the author, are compared. The study shows the two analogue networks to have very nearly the same performance provided that a small time delay in the network advocated by the author is taken into account. (Author)

NASA-TN-D-1972
Stanford Univ., Calif.
HEAT TRANSFER WITH LAMINAR FLOW IN CONCENTRIC ANNULI WITH CONSTANT AND VARIABLE WALL TEMPERATURE AND HEAT FLUX
R. E. Lundberg, W. C. Reynolds, and W. M. Kays.
Aug 63, 212p
Grant NsG-52-60
N63-20324
OTS $3.50

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

OTS SB-442, Suppl. 1
Office of Technical Services, Dept. of Commerce, Washington, D. C.
CHINESE MAINLAND SCIENCE AND TECHNOLOGY.
Nov 63, 39p
OTS Selective Bibliography SB-442, Suppl. 1
OTS $0.10

DESCRIPTORS: *China, *Science, Agriculture, *Bibliographies, Biology, Behavior, Chemistry, Geology, Engineering, Machines, Metallurgy, Physics, Mathematics, Scientific research.

Lists 555 translations added to the OTS collection during the period March 1961 through August 1963. Reports are listed in the following categories: Agriculture; Biological and Behavioral Sciences; Chemistry; Earth Sciences; Engineering; Machinery; Metallurgy; Physics and Mathematics; Research Methods; Techniques and Equipment; Bibliographies. (Author)

OTS SB-477, Suppl. 1
Office of Technical Services, Dept. of Commerce, Washington, D. C.
JAPANESE SCIENCE AND TECHNOLOGY. Aug 63, 71p
OTS Selective Bibliography SB-477, Suppl. 1
OTS $0.10

DESCRIPTORS: *Japan, *Science, *Bibliographies, Biology, Behavior, Chemistry, Chemical engineering, Geology, Engineering, Food, Fishes, Agriculture, Machines, Materials, Metallurgy, Physics, Mathematics, Patents,

Lists 1164 translations added to the OTS collection during the period July 1961 through August 1963. Reports are listed in the following categories: Biological and Behavioral Sciences; Chemistry; Chemical Engineering; Earth Sciences; Engineering; Food; Fish and Agriculture; Machinery; Materials; Metallurgy; Physics and Mathematics; Patents. (Author)

Communication Theory

AD-284 603
Ohio State Univ. Research Foundation, Columbus.
CONSONANT INTELLIGIBILITY WITH SELECTED VOWELS IN QUIET AND NOISE
Herbert Rubenstein and William V. Hagin. May 61, 13p
Contract AF19(604)6179
Technical rept. no. AFESD-TN-61-36
OTS $1.60

DESCRIPTORS: *Intelligibility, *Speech transmission, Speech representation, Speech, Noise, Intensity, Signal-to-noise ratio, Measurement, *Speech recognition,

Low signal intensity is a satisfactory substitute for making noise in testing consonant intelligibility. Testing conditions of comparable difficulty produce approximately the same intelligibility values, similar spread of intelligibility values, and similar confusion frequencies. In regard to different vowels, all intercorrelations are significant regardless of test conditions; the correlations obtained under noise conditions are slightly higher than those obtained at low signal intensities. In both test conditions, the vowels [i] and [e] appear to affect consonant intelligibilities most similiarly. (Author)

AD-284 602
Ohio State Univ. Research Foundation, Columbus.
INTELLIGIBILITY OF BEGINNING AND ENDING CONSONANTS WITH THE VOWEL [I]. Technical rept. 65
Henry M. Moser and Wallace C. Fotheringham. May 61
23p
Contract AF19(604)6179
RF Proj. 1080; AFESD TN-61-37
OTS $2.60

DESCRIPTORS: *Intelligibility, Speech transmission, Speech representation, Speech, Noise, Intensity, Signal-to-noise ratio, Measurement, *Speech recognition,

The rank order of consonant intelligibility varies with speakers but is significantly more stable for initial consonants and for speakers of the same sex. Final conconants are more intelligible than initial consonants.

Confusions among initial and final consonants are similar. Confusions are most frequent among members of the same class of consonants; e. g. stops, fricatives, nasals, etc. Apparently, different places of articulation (labial, dental, alveolar, etc.) do not provide a sufficient basis for distinguishing members of a class. Consonant clusters tend to be less intelligible than single consonants. Confusions for consonant clusters are similar in class to the component sounds of a cluster. CVC units formed from the most intelligible CV and VC syllables are significantly more intelligible than units formed from the least intelligible syllables. It appears that, given the intelligibility values of consonants composing a cluster, no definitive prediction can be made of the intelligibility of the cluster. (Author)

SOCIAL SCIENCES

NASA-SP-6001
National Aeronautics and Space Administration, Washington, D. C.
APOLLO TERMINOLOGY. Aug 63, 121p
OTS $2.75

AD-266 929
[Research Analysis Corp.] Bethesda, Md.
PROGRAMMING COMPUTER-ASSISTED TRANSPORTATION PLANNING
Martin W. Brossman, Robert G. Busacker, Ralph A. Hafner, M. Wanda Porterfield, and Strother H. Walker.
May 61. 88p
Staff Paper ORO-SP-160
OTS $8.10

DESCRIPTORS: *Logistics, *Transportation, *Armed forces transportation, *Cargo, Military personnel, Railroads, Vehicles, Mobilization, *Programming (Computers),

Contents:
Introduction
General terminology
Computation of dry-cargo tonnages
Apportionment of log dry-cargo workloads to destinations
Utilization of rail and highway networks
Summarization of origin and LOC tonnages
Class IV and toe requirements

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U.S. DEPARTMENT OF COMMERCE FIELD OFFICES

SERVE THE BUSINESS COMMUNITY

The Department of Commerce maintains Field Offices to enable the business community to avail itself locally of Government facilities designed to promote commerce. Working closely with various units in the Department and, when necessary, with other Government agencies, the Field Offices provide business services to manufacturers, wholesalers, retailers, trade publications, trade associations, advertising agencies, research groups, financial institutions, and exporters and importers.

Experienced personnel will gladly assist in the solution of specific problems, explain the scope and meaning of regulations administered by the Department, and provide practical assistance in the broad field of domestic and foreign commerce. Field Offices act as official sales agents of the Superintendent of Documents, and maintain an extensive business reference library containing periodicals, directories, publications and reports from official as well as private sources.

Among the many services which businessmen have found of value are:

GENERAL

- Management and business aids
- Establishing a new business

BASIC ECONOMIC DATA

- Census data with national and often State and regional breakdowns, on manufacturing wholesaling, retailing, service industries, employment and unemployment, population, housing, agriculture
- Basic records of national income and product, regional trends, balance of payments, foreign aid

MARKETING AND DISTRIBUTION

- Development and maintenance of markets
- Distribution channels, facilities and services
- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
- Economic conditions in foreign countries

COOPERATIVE OFFICES

To make the services of the Department of Commerce more widely available, agreements have been entered into with more than 750 Chambers of Commerce, Manufacturers Associations, and similar business groups under which these organizations have become official Cooperative Offices of the Department. If specific information is not on hand in the Cooperative Office, your problem will be referred to the nearest Departmental field office.

Department Field Offices

Albuquerque, N. Mex., 87101, U. S. Courthouse. 247-0311.
Anchorage, Alaska, 99501, Room 60, U.S. Post Office and Courthouse. Phone: BR 2-9611.
Atlanta, Ga., 30303, 75 Forsyth St., N.W. JAckson 2-4121.
Birmingham, Ala., 35203, Title Bldg., 2028 Third Ave., North. Phone: 323-8011.
Boston, Mass., 02110, Room 230, 80 Federal Street. CApitol 3-2312.
Buffalo, N.Y., 14203, 504 Federal Building, 117 Ellicott St., TL 3-4216.
Charleston, S. C., 29401, Suite 201, Marcus Building, 6 Broad Street. Phone: 722-6551.
Cheyenne, Wyo., 82001, 207 Majestic Bldg., 16th & Capitol Ave. Phone: 634-2731.
Chicago, Ill., 60606, Room 1302, 226 West Jackson Blvd. 828-4400.
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Cleveland, Ohio, 44101, 4th Floor, Federal Reserve Bank Bldg., East 6th St. & Superior Ave. 241-7900.
Dallas, Tex., 75201, Room 3-104, Merchandise Mart, 500 South Ervay Street. Riverside 8-5611.
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Milwaukee, Wis., 53203, Straus Bldg., 238 W. Wisconsin Ave. Phone: BR 2-8600.
Minneapolis, Minn., 55401, Room 304, Federal Bldg., 110 South Fourth Street. Phone: 334-2133.
New Orleans, La., 70130, 1508 Masonic Temple Bldg., 333 St. Charles Avenue. Phone: 529-2411.
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Philadelphia, Pa., 19107, Jefferson Building, 1015 Chestnut Street. WAlnut 3-2400.
Phoenix, Ariz., 85025, New Federal Bldg., 230 N. First Avenue. Phone: 261-3285.
Pittsburgh, Pa., 15222, 1030 Park Bldg., 355 Fifth Avenue. 471-0800.
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Reno, Nev., 89502, 1479 Wells Avenue. Phone: FA 2-7133.
Richmond, Va., 23240, 2105 Federal Building, 400 North 8th Street. Phone: 649-3611.
St. Louis, Mo., 63103, 2511 New Federal Building, 1520 Market Street. MAin 1-8100.
Salt Lake City, Utah, 84101, 222 S. W. Temple St. DAvis 8-2911.
San Francisco, Calif., 94011, Room 419, Customhouse, 555 Battery St. YUkon 6-3111.
Santurce, Puerto Rico, 00907, Room 628, 605 Condado Ave. Phone: 723-4640.
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